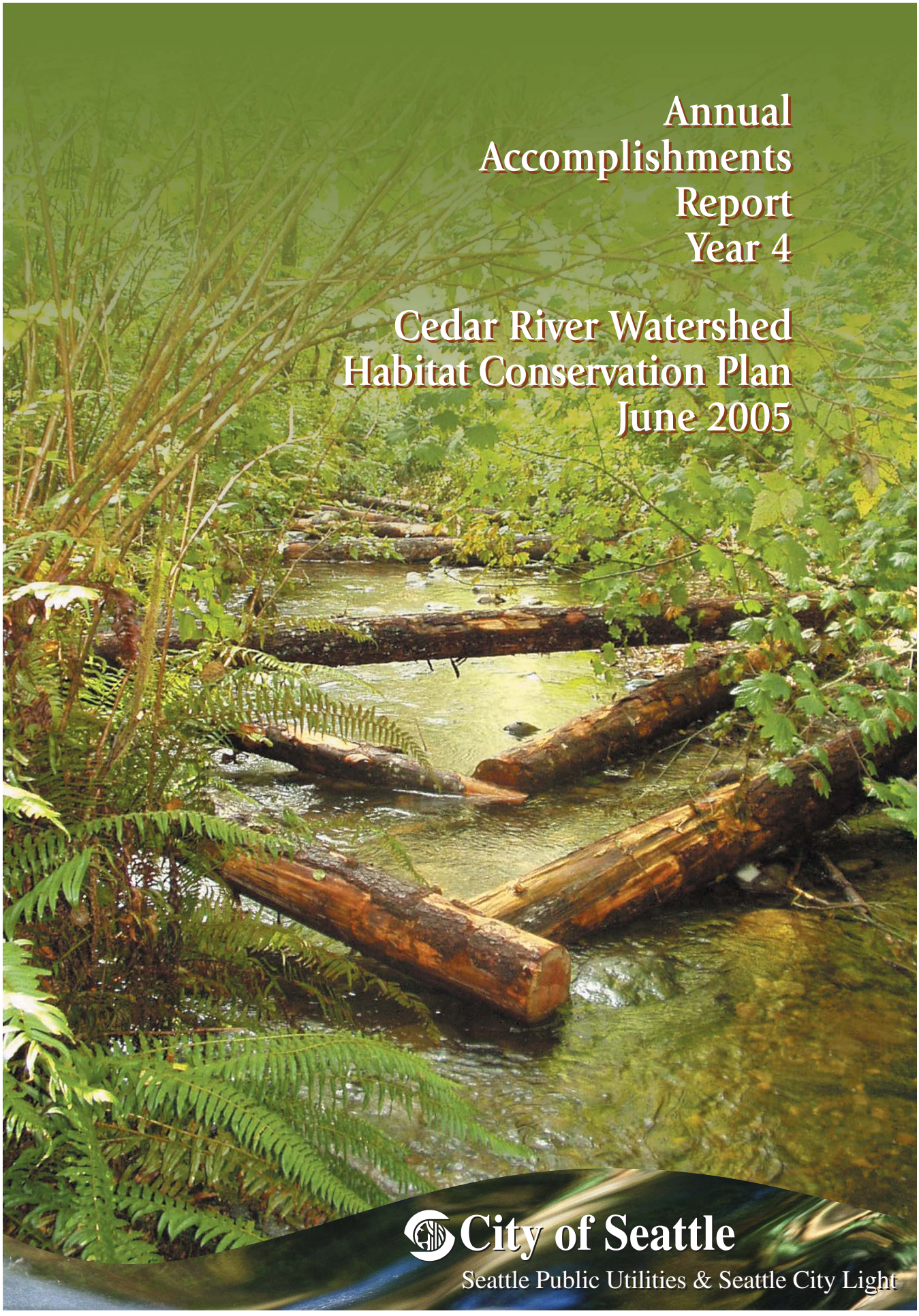
Annual Accomplishments Report Year 4

Cedar River Watershed Habitat Conservation Plan June 2005



City of Seattle

Seattle Public Utilities & Seattle City Light

Cedar River Habitat Conservation Plan

Annual Accomplishments Report
Year 4

Seattle Public Utilities & Seattle City Light
June 2005

ERRATA

for

HCP Year 3 Accomplishments Report, June, 2004

July 8, 2004

The attached three pages, containing tables and graphs describing 2003 Landsburg Dam fish passage data, were omitted from the document. They should follow Page 56.

TABLE 1: Brood Year 2003 Landsburg Fish Passage Operation
Upstream Fish Count Summary summary

	Chinook Salmon	Coho Salmon
Adipose fin present	24	43
Adipose fin absent	55	4
Male	63	26
Female	16	21

TABLE 2: Landsburg Fish Passage Operations
Brood Year 2003 Fish Passage Counts

Count of Species	Adipose Absent			Adipose Present				Grand Total
Species	*Female*	*Male*	*Total*	*Female*	*Male*	*Unknown*	*Total*	*All*
Chinook	10	45	55	6	18		24	79
Coho	3	1	4	18	25		43	47
Chum	0	0	0	0	1		1	1
Cutthroat Trout				0	0	1	1	1
Grand Total	13	46	59	24	44	1	69	128

Figure 1: 2003 Landsburg Fish Passage Operations: Daily chinook salmon passage

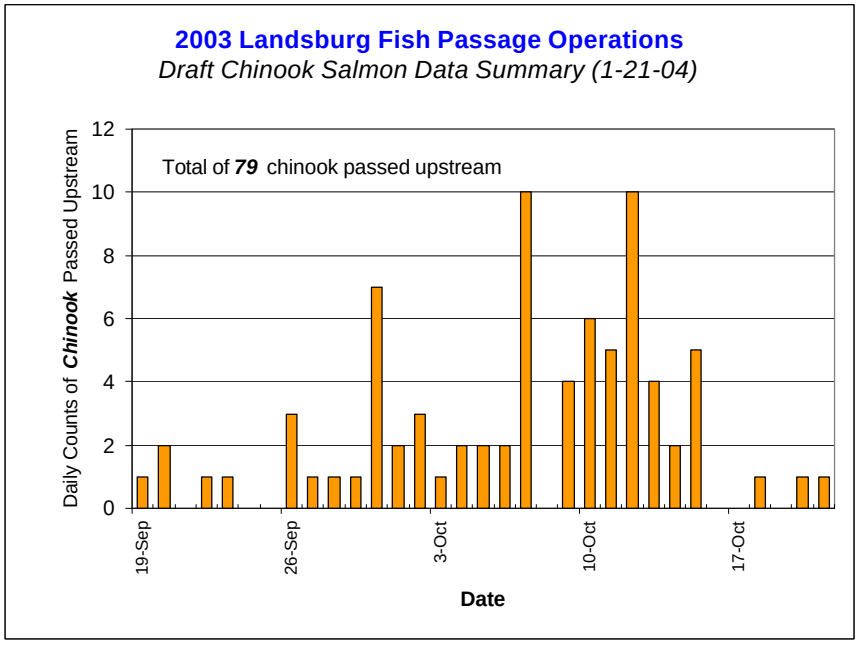
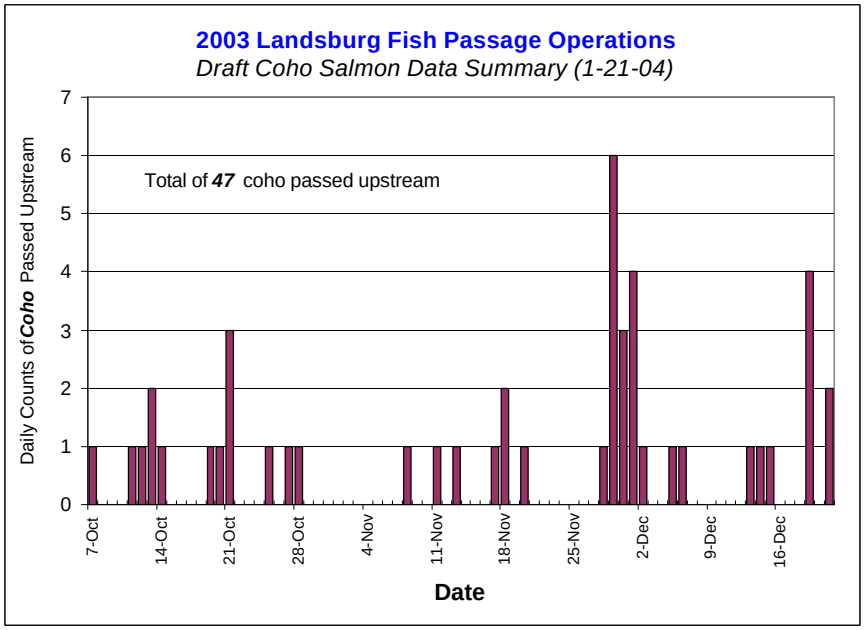


Figure 2: 2003 Landsburg Fish Passage Operations: Daily coho salmon passage



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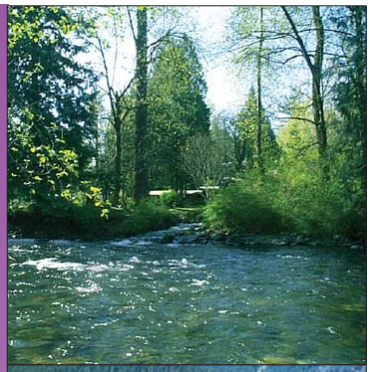
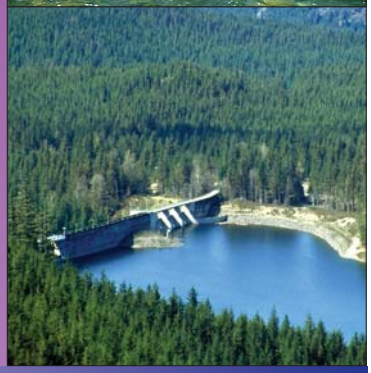
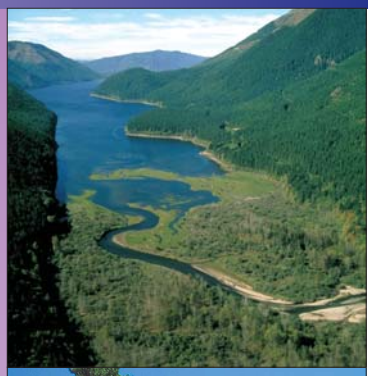
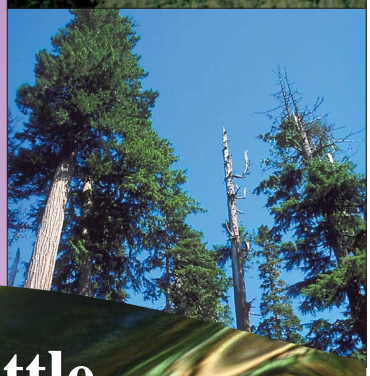




Executive Summary





City of Seattle

Seattle Public Utilities & Seattle City Light

Executive Summary

The arrival of each new year of HCP implementation brings with it new learning, challenges and ideas. Insofar as the work for the HCP is clearly prescribed through the 50-year term of program, each additional year yields surprises. This paradox is the core challenge of implementing the HCP—satisfying the commitments described in the detailed HCP document while managing the program adaptively to respond to new information and circumstances. The *adaptive management* provisions included in the HCP provide a framework for meeting this challenge; filling in the details of that framework as each year progresses is the work that will keep the HCP moving in the right direction toward meeting the biological objectives.

Four years after the signing of the HCP agreements, much of the capital project work planned for the early years of implementation is well underway and in some cases complete. Many research and monitoring efforts designed to follow-up and support capital work have commenced. In coming years, that research and monitoring will yield results and an increasing opportunity to manage adaptively.

This year's Accomplishment Report includes a new section highlighting the Bonneville Power Administration Settlement Agreement work efforts. (See below under the Watershed Management section of this Executive Summary for more detail.) Because many of the projects and activities funded by the BPA Settlement Agreement augment HCP projects and activities that are occurring up in the Cedar River Watershed, this Annual Accomplishments Report seemed like the most logical venue to report on the BPA work.

HCP Program Management

In 2004 (HCP Year 4), the City of Seattle's process for developing the 2005-06 budget provided us with the opportunity to align HCP commitments with our SPU budgets. In the previous budget cycle, 2003-2004, HCP project and activity managers were challenged to meet HCP commitments while satisfying significant budget reduction requirements in response to the weak economy and resultant reduced City revenues. In last year's 2005-06 budget process, we successfully covered our HCP financial commitments while we continued to find ways to implement the HCP more efficiently, for example, eliminating budget for consultants where staff was able to do the work.

On the legal front, Muckleshoot Indian Tribe and City representatives met in mediation to attempt to settle the Tribe's challenge over instream flows, and discussions are continuing.

To help us manage the complex financial and performance details of the HCP, we have worked with our Information Technology staff to develop an information management system designed specifically for the HCP. The system will track our HCP commitments, both financial and performance, and allow us to more easily access data to compare these commitments to actual dollars expended and work performed.

Watershed Management

HCP activities in the watershed continued on the two parallel tracks initiated in Year 1: planning and implementing projects on the ground in the near term, and developing long-term, landscape-level plans to guide the performance of work as the program progresses. Interdisciplinary teams continued to develop long-term strategic plans for characterizing the watershed to support restoration planning, monitoring projects and habitats, prioritizing areas for restoration, and developing an information management system to support these activities. In addition, a new team was formed to synthesize the work of the different interdisciplinary teams into an overall landscape approach that takes advantages of potential synergies among different types of restoration. We expect to finalize the strategic plans and the synthesis in 2005. We continued to make progress on many restoration projects, and had the able assistance of many volunteers in getting projects done. A total of 218 volunteers

contributed a total to 1065 hours removing invasive plants; planting conifers, deciduous trees, and shrubs; rebuilding and improving an interpretive trail; and installing a grade control structure in a stream at a road crossing.

As mitigation for the construction during 2003 of a new transmission line through the municipal watershed, BPA contributed $6 million to SPU. The BPA mitigation program began in late 2004, as described in a separate summary in this document. Launching various projects under this mitigation program resulted in some conflicts with accomplishing HCP work, but most HCP restoration projects were still completed as planned.

We decommissioned 9.1 miles of road in 2004. Road decommissioning projects were linked with other HCP aquatic restoration projects (streambank stabilization, and streambank revegetation) whenever possible to increase the ecological benefit of removing the road. This brings the total for the first four years of the HCP to approximately 37 miles, a little below the 10 miles per year average expected under the HCP, although we expect to meet the HCP Commitment to decommission approximately 10 miles per year over the first 20 years. To reduce sediment loading from watershed roads to water bodies, crews also did improvement work on five miles of road, including culvert installations, road surfacing, ditching, and pullback of road edges. About 200 feet of the 200 Road was also realigned at Rack Creek to solve a problem with erosion of the bank along the original roadbed.

The road inventory initiated in 2003 was essentially completed in 2004. The data will be used to plan road work, and are being used in a sediment delivery model to estimate the sediment contributions of different road segments. The model output, considered with reference to expected patterns of natural sediment loading to streams, will help focus road improvement and decommissioning projects on roads with the biggest adverse environmental effects.

An arch culvert was installed on a Carey Creek tributary on the 19 Road to effect fish passage. Inadequately sized culverts were replaced on three roads to pass predicted peak flows without failure. EarthCorps and Watershed Management Division staff completed a large woody debris placement project on Rock Creek, installing 50 pieces of wood using a hand cable system in 500 feet of stream. We planted 280 linear feet of streamside areas in Seattle and Goat Sub-basins during the fall of 2004 to accelerate the recovery of streambanks and associated riparian zones disturbed by road decommissioning work. Revegetation projects were linked to stream crossings on decommissioned roads, because these restored stream crossings tend to have extensive bare soils directly adjacent to streams.

An area of about 37 acres of young riparian forest was thinned along Seattle Creek and an area of about 8 acres was thinned along Troublesome Creek in the upper watershed, in association with upland restoration thinning. With assistance from EarthCorps, we planted seedlings of western redcedar and Sitka spruce, and various native shrubs along about 500 linear feet of Rock Creek in the lower watershed, in conjunction with the large woody debris placement project describe above.

We conducted approximately 650 acres of restoration thinning in young forest of different ages, primarily in the upper watershed and in Pacific silver fir forest, retaining the larger trees and a diversity of species. SPU also supported development of a Master's thesis research project investigating forest development patterns in the Pacific silver fir zone. The results of this research will inform decisions about forest tree density and spatial patterns in the restoration thinning program.

The 700 Road upland ecological thinning project was deferred from its planned implementation in 2004 to allow for a substantial public involvement process. SPU staff hosted a Forest Restoration Workshop in July, which covered the forest restoration program and included a field trip to the 700 Road thinning project site. Several other field trips and meetings were conducted during the year, and the written

project plan was released for review by experts and interest groups. The plan was revised several times in response to comments. A plan to plant trees, shrubs, and non-traditional flora in conjunction with the 700 Road thinning project was also delayed. We expect the ordinance to authorize the project to be submitted to the Seattle City Council for approval in spring of 2005. To support planning future forest restoration projects, we collected field data in areas identified through landscape modeling as the best areas for forest restoration in support of species covered by the HCP.

Monitoring was conducted for a number of aquatic, riparian, and upland forest projects, including the 2004 Rock Creek large woody debris project (aquatic), the 45 Road Forest Restoration Project (upland), and Webster Creek, Shotgun Creek, and Taylor Creek (riparian). We also began development of a long-term monitoring plan and determining linkages between project monitoring and long-term stream and riparian monitoring. We consulted with NOAA Fisheries on watershed scale monitoring and the use of ranked sampling in a long-term monitoring program. We also completed a memorandum of agreement (MOA) with the USGS to determine the best use of benthic macroinvertebrates to meet the long-term HCP monitoring objectives for streams.

An additional 60 permanent sampling plots were installed in second-growth, upland forest, bringing the total to about 100 plots in the watershed. These plots will be monitored over time to determine forest development patterns and are being used with remote sensing data to characterize forest habitats for restoration work.

We continued the program for deploying floating platforms for loons in the reservoir system and monitoring nesting success. Artificial nest platforms were deployed in each of the three traditional nesting areas in which loons nest. The pair on the Cedar River delta apparently did not nest. The pairs on the Rex delta and Masonry Pool nested on platforms, but were unsuccessful. The pair on the Masonry Pool apparently re-nested at a natural site, as a large chick was later sighted on the territory.

The adfluvial bull trout population present in Chester Morse Lake spawned again in record numbers in core spawning reaches of major lake tributaries during fall/early winter of 2004-05. A total of 587 redds were found, the highest in the five years of intensive surveys.

We conducted a comprehensive review of 1992-1993 forest inventory stand and attribute data and associated remote sensing data layers, determining that existing expanded forest data is insufficient to meet needs for prioritizing upland forest restoration project sites. We initiated an evaluation of options for developing data to support landscape-level planning for forest restoration.

Using BPA mitigation funds, we initiated an evaluation of LiDAR (remotely sensed) data obtained from King County to determine whether LiDAR data might be adequate for landscape-level planning. The LiDAR data set includes a surface model for the ground and one for the top for the forest canopy. Initial results indicated that tree heights could be estimated with reasonable confidence, and that tree stem density could also be estimated reasonably well, at least under some circumstances. This evaluation will continue in 2005 as more data become available, and we intend to determine if tree diameter can also be estimated using regression techniques.

Also, using BPA mitigation funds, we:

- Initiated development of an information management system for the road network, part of a suite of information management systems under development for habitats and species, and

- Conducted hydrological and water quality monitoring, and legal analysis, as part of an evaluation of the feasibility of rerouting the drainage from Walsh Lake out of Walsh Lake Ditch and back to Rock Creek.

Landsburg Mitigation

2004 Sockeye and Chinook returns

The return of sockeye to the Cedar River was about 125,000 in 2004 (preliminary estimate from WDFW). The chinook return was relatively strong compared to recent years, with over 480 redds (preliminary data) being counted in the Cedar River. The Cedar River sockeye hatchery used about 8,000 sockeye as broodstock and collected 16.7 million sockeye eggs for the hatchery. Unusually high flows in September made broodstock collection difficult during the early part of the run. After that, broodstock collection continued normally into November. As in previous years, substantial numbers of sockeye spawned below the broodstock collection facility and were unavailable as broodstock.

Sport and tribal sockeye fisheries were held in 2004. The sport fishery attracted thousands of fishermen and openings were held on X days. Estimated sport catch amounted to X fish. Tribal harvest amounted to x fish. Otoliths were collected from sockeye heads that were submitted voluntarily from sport fishermen. Tribal catches were sampled as well.

HCP funding was used to study the entry timing and movement of sockeye again in 2004. Unlike last year, a relatively large proportion of acoustic transmitters placed on sockeye as they passed the fish ladder at the locks were not detected subsequently by fixed and mobile receivers. The missing fish were released towards the end of July and later, during a time when water temperatures at the locks were above 21° C (70° F).

2004 Juvenile Outmigrants from the Cedar River

The interim sockeye hatchery released just under 10 million sockeye fry in 2004. No IHN outbreak occurred this year. Production was less than capacity because broodstock collection was primarily impacted by the loss of the weir due to high flows in October 2003.

Total sockeye fry production from the Cedar River in 2004 was estimated at 48 million total (preliminary data), including 38.7 million natural fry. This is the second highest level of total fry production since trapping began in 1992 and the fourth consecutive year where total sockeye fry production from the Cedar River has exceeded 40 million. The 2004 fry outmigration is two generations removed from the 1996 outmigration year when severe scour-induced mortality resulted in few natural origin fry leaving the system. The ratio of hatchery origin to natural origin fry was over 7:1; in all other years this ratio is less than 1:1. Despite the high ratio of hatchery fry, this year of the four-year cycle is now as robust as the other three years: a marked change in two generations.

The 2004 outmigrant count of total juvenile chinook production from the Cedar River was nearly 121,000, about the same as that in 2002. This level is lower than the best outmigrant year, 2003 (231,500), but well above years, 1998-2000 (range: 32,000-81,000). The number of smolts produced was second highest of the six years that monitoring has been conducted, while the number of fry ranked fourth.

Sockeye Monitoring and Evaluation

WDFW sampled sockeye smolts in Lake Union for the first time. Results provided information on the effects of holding and short term rearing on survival, on comparisons between natural and hatchery fry and on the effects of timing and release location on survival.

This was the second year of UW tagging study on sockeye entering the Lake Washington system. A paper has been submitted for publication concerning temperature preferences of sockeye in the lake. A key goal of the research was to better understand how Cedar River sockeye and Lake Washington northern tributary sockeye enter and disperse in Lake Washington to aid fishery managers.

WDFW collected otoliths from sockeye carcasses from the Cedar River again this year and included a study of additional factors that may bias collections (eg. size, sex). Results from sampling at Landsburg indicated that sockeye entering the ladder were made up of about 64% natural origin.

A study, partially funded by the HCP, was published on food supply and sockeye in Lake Washington. The study found that sockeye do not consume a large percentage of zooplankton during the spring prior to the large Daphnia bloom, making it unlikely that higher sockeye levels will materially affect food supply. The authors note that monitoring should continue, however, due to potential impacts from other planktivores and interannual variation.

Anadromous Fish Committee
AFC held 9 meetings in 2004. The committee focussed on Interim coho, chinook and steelhead program by establishing priority areas of interest and inviting proposals. The committee provided suggestions for improving the for the WRIA 8 chinook genetics study and members helped ensure that samples were collected. The AFC oversaw hatchery and research and monitoring activities and provided an ongoing forum for discussion of factors affecting salmonids in the Cedar River and Lake Washington.

Interim Mitigation for Coho, Chinook and Steelhead
Interim mitigation funding was used to support a variety of projects designed to learn more about the target species. The largest investment was the installation of adult PIT tag readers at the locks. This equipment allowed researchers to evaluate the proportion of smolts that use the smolt flumes and to study how many fish ascend the fish ladder multiple times. Program funding is being used to study recolonization by coho and chinook in the area above Landsburg. The *O. mykiss* (steelhead and rainbow trout) genetics study continues with the goal of developing a better understanding of the genetic relationships between various groups and this information will be used to inform recovery planning.

New Sockeye Hatchery
The FEIS appeal and the Seattle Hearing Examiner's decision issued late in 2003 required the development of a supplemental EIS. Work on the SEIS proceeded throughout 2004 and included a worst case analysis workshop that brought together experts in specific areas to help the City develop the technical basis for the SEIS. Further work on the adaptive management plan was done during 2004, including further development of thresholds.

Hatchery facility design was 90% complete at the end of 2004 and has been reviewed by both WDFW and Muckleshoot Indian Tribe staff. Additional work was done to refine the design of the broodstock collection weir to address concerns expressed by the City of Renton in discussion of the feasibility of using the I-405 site. The Renton Utilities Committee invited SPU to provide a briefing on the status of the broodstock collection project. Design changes and other information reduced concerns about the project and Renton elected officials directed the Renton staff to develop specific project requirements.

Delay in completion of the environmental review for the project will likely result in a two-year delay, with facilities scheduled for completion in 2007.

Instream Flow Management
To be added.

BPA Mitigation Program
The Bonneville Power Administration provided mitigation funds for construction of a new transmission

line across the Cedar River Municipal Watershed. In addition, new adjoining-watershed properties were provided by BPA. The Settlement Agreement provided $6 million to the City's Water Fund, approximately $640,000 from the sale of timber from the new right of way, and transfer of three properties to the City (approximately 563 acres, referred to as the "acquired properties"). The Agreement specified that funds be used in the Seattle municipal watershed to generally accelerate, expand, and/or enhance activities in four categories of BPA's project-related impacts: Aquatic and riparian habitats, roads, security, and upland forests.

In 2004, SPU initiated BPA work in each of the four aforementioned categories. A major focus was to scope, schedule and budget work for the BPA Mitigation Program and to plan and develop and to implement 2004 projects. Initial projects were for assessments and improvements to the newly acquired properties and to develop information systems that will facilitate work in 2005 and beyond. An emphasis for use of the BPA Mitigation Program funds is for on-the-ground improvements. In order to meet this goal, 2004 funds were also used for up front planning and information management system development.

An SPU management advisory group (MAG) was assembled to oversee the BPA Mitigation Program. The MAG is comprised of various SPU leads and directors. The MAG used the BPA Agreement, City Council ordinance, a guiding document created for the program, and input from the BPA stakeholders as presented in 2003 and at a City Council briefing in June 2004. Development of BPA program projects was coordinated with the HCP program and goals, as well as, other SPU projects and priorities.

A comprehensive approach was developed and initiated, in 2004, for the newly acquired properties, called Selleck, Trillium, and Foothills. The Yakima Pass property has not yet been transferred to the city. On the Selleck property, property boundaries were surveyed and physically marked. Forest restoration was planned and implemented to move the forest stands from a traditional forest plantation to a more biologically diverse condition. The work consisted of restoration thinning and mechanical removal of an invasive alien plant species. Work on Trillium consisted of surveying and physically marking property boundaries. A forest restoration plan was developed for the Foothills property and supplemental biodiversity planting was done on the decommissioned roads and old building pads. In addition, invasive alien plant species were inventories and limited hand and mechanical pulling done. Sections of Foothill fences were demolished, repaired or installed to provide security and not adversely impact wildlife. Sections of existing roads were decommissioned or restored. Revegetation was planned for all soil disturbed during decommissioning.

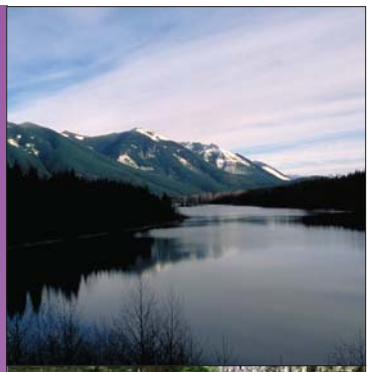
Information management systems were built and computer systems were purchased to improve knowledge of work completed, projected and needed and to give real-time data. A system was developed in 2004, and will go into production in 2005, to more effectively and efficiently track work and budgets for the HCP and BPA programs. A data system showing conditions and improvement or maintenance needs of watershed roads was initiated in 2004. Also, a security system was developed for quick and accurate information on watershed access and to give isolated staff real-time communications with data and people. Along with the security information system, vehicle laptops and satellite phones were purchased and work was started for wireless connection. Systems for upland forest and fish and wildlife will be developed in 2005.

A telemetry receiver was purchased and used at Landsburg Dam to track tagged adult coho immediately after release. Tagging results showed the length of time spent in the watershed and the number passed back down through the dam. Coho and Chinook redd surveys were conducted in the newly accessible habitat above Landsburg Dam. In addition, a plan was developed to study the feasibility of reconnecting Walsh Lake Ditch with Rock Creek. As part of the study, hydrologic and water-quality monitoring equipment was purchased and installed and hydrologic monitoring and data collection begun. Upstream

of the Road 10 crossing, large woody debris (LWB) pieces were placed in Rock Creek by using a hand cable system. LWD pieces were also placed in the floodplain to improve channel migration and riparian restoration.

In order to decommission and/or improve Roads 33, 60 and 80, a consultant completed environmental studies and drafted road decommissioning and/or improvement designs. A pre-application permit meeting was held with the State of Washington. Following through, in 2005, design and on-the-ground work will be conducted.

The U.S. Department of Agriculture (USDS) Forest Service was hired to conduct work in 2005 analyzing and reporting on watershed current forest fire hazards, predict future hazards, and to identify options to minimize the hazards. Working with the University of Washington forestry experts, a scope of work was developed and negotiated for a multiyear scientifically-designed experiment to address key upland forest restoration questions on ecological thinning. Results will be used to implement the HCP ecological thinning program.



HCP Background

City of Seattle

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HCP PROGRAM ELEMENT SUMMARIES

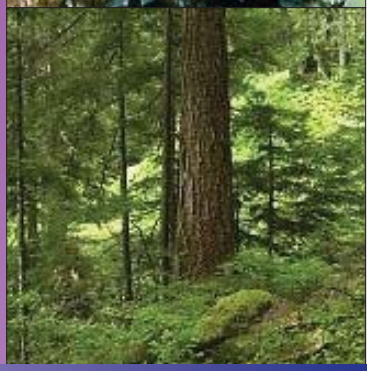
HCP Background

The HCP, approved in April 2000, is a comprehensive, ecosystem based plan for the Cedar River Municipal Watershed and areas downstream affected by river flows. The HCP incorporates more than 10 years of scientific research and monitoring, and commits more than $90 million over the next 50 years to improve conditions for fish and wildlife. The plan will substantially contribute to ensuring that our region has an ample supply of high-quality drinking water well into the 21st century by meeting the requirements of the Endangered Species Act with regard to 83 species of fish and wildlife addressed in the HCP. It addresses many long-standing issues between the City of Seattle and the State of Washington regarding the blockage to anadromous fish posed by the Landsburg Diversion Dam. It also represents the completion of a long-running effort with state and federal agencies to develop technically sound instream flows in the Cedar River to protect salmon.

Because the Cedar River Municipal Watershed contains the headwaters of the major river that discharges into Lake Washington, management of the watershed and the Cedar River's instream flows represent a very important regional opportunity to protect and restore both salmon and other species that are dependent upon late-successional and old-growth forests. The watershed is important not only as the region's primary water supply but also as the major source of downstream river flows necessary to maintain habitat for anadromous salmonids. In addition, the municipal watershed offers one of the few significant opportunities to reestablish a block of mature, late-successional, and old-growth forest below 3,000 ft in a manner that could effectively link this forest block to existing old-growth in other areas of the Cascade Mountains.

As part of the HCP, the City of Seattle has made a 50-year commitment to a wide variety of programs providing significant benefits to fish and wildlife found throughout the entire Cedar River system. These commitments are in three primary categories: **Watershed Management**, **Landsburg Mitigation**, and **Instream Flows**. The HCP includes conservation measures and research and monitoring efforts in all three categories. In developing the Cedar River Watershed HCP, the City understood that undertaking a comprehensive, 50-year habitat protection and restoration program could be successful only with significant commitments to fund and implement monitoring and research activities. This includes: (1) compliance monitoring to determine whether HCP programs and elements are implemented; (2) effectiveness monitoring to determine whether HCP programs and selected elements result in the anticipated changes in habitat or other conditions for the species of concern; and (3) cooperative research to obtain more information on species of concern, test critical assumptions in the plan, and gain understanding needed to refine management decisions to meet plan objectives.

The sections that follow provide a finer level of detail for each program element's first year accomplishments (Program Element Summaries). The Program Element Summaries are organized into the three HCP Categories (Watershed Management, Landsburg Mitigation and Instream Flows) and each section is preceded by an explanation of the HCP Program Category.



Watershed Management Summaries

City of Seattle

Seattle Public Utilities & Seattle City Light

Watershed Management Background

The Cedar River Municipal Watershed supports a variety of species that are at risk in the region, largely as a result of habitat degradation and loss. Within the watershed the northern spotted owl, marbled murrelet, bald eagle, and bull trout are found, as well as other terrestrial and aquatic species that are at risk regionally. Since the fish ladders were constructed at the Landsburg Diversion Dam in 2003, native anadromous salmonids, such as chinook salmon
and steelhead trout, now have access into the Watershed. The HCP's watershed management mitigation and conservation strategies are designed to protect and contribute to the restoration of the habitats of at-risk species, and to contribute to the restoration of ecological and physical processes and functions that create and maintain key habitats.

The proposed mitigation represents a landscape approach to watershed management that includes both a commitment not to harvest timber for commercial purposes within the municipal watershed, effectively creating an ecological reserve that includes all forest outside limited developed areas, and a significant commitment to habitat restoration. These measures were developed collectively to mitigate for impacts of past land management activities, and they were developed in an integrated fashion to foster natural biological diversity and to help restore much of the watershed to more natural conditions.

Following is a listing of the specific components of the City's commitments under Watershed Management:

- Eliminate timber harvest for commercial purposes, effectively creating a watershed ecological reserve that includes all forest outside the few developed areas and that will provide long-term, comprehensive protection of the watershed ecosystem
- Develop and implement a comprehensive program to restore fish and wildlife habitats in the watershed that have been degraded by past activities, such as logging and road construction
- Commit to removing approximately 38% of the forest roads within the watershed by the end of HCP year 20
- Use restoration thinning, planting, and similar approaches to restore the natural ecological functions and processes in watershed forests that create and maintain habitats for at-risk species
- Design and conduct projects to restore habitat in streams and streamside areas and to improve water quality over the long term
- Design and conduct comprehensive research and monitoring studies that will provide the information needed to improve our ability to achieve the conservation objectives of the HCP over the long term

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS
under the Watershed Management program category.

HCP Program Element: Cedar River Watershed Biodiversity Initiative (to support restoration and monitoring in aquatic, riparian, and upland habitats)
HCP Program Category: Watershed Management

Contact: David Chapin, Watershed Ecologist, and Clay Antieau, Senior Watershed Planner, Watershed Management Division

Objectives & Goals

Protecting, restoring, and monitoring natural biodiversity are stated goals of the HCP. Thus, it is important to have a framework for acquiring, documenting, organizing, and housing biodiversity data during the course of the HCP and beyond. The Cedar River Watershed Biodiversity Initiative (CRWBI) is intended to provide this framework by: (1) defining biodiversity in the context of the HCP; (2) developing a biodiversity database for the Watershed; (3) conducting targeted field surveys and biodiversity research and monitoring; (4) interpreting biodiversity data within the Watershed's biogeographical context; and (5) facilitating biodiversity research in the region. This project is part of the Watershed Characterization project (see separate summary).

Status of Work (2004)

- ***Document information from past ecological and taxonomic studies in the watershed***

  Based on work in 2001, the considerable amount of research that has been conducted in the Watershed over many decades continues to be compiled into an organized bibliography. Staff continues to build on a bibliography of over 350 references, from which we are extracting pertinent biodiversity data.

- ***Collaborate with UW Botany Department on collecting and cataloging vascular plants (Botanical Resource Inventory)***

  This project was quiescent during 2004.

- ***Continue studies on presence and distribution of invertebrates***

  Dr. Rick Sugg concluded his survey of terrestrial invertebrates in the Watershed in 2003. This work initially focused on ground-dwelling invertebrates across the Watershed. No additional work with invertebrates has been conducted.

Looking Ahead (Planned 2005 Accomplishments)

The HCP Biological Diversity Initiative will continue in 2005 with major tasks focused on continuing biological inventory (specifically focusing on the Botanical Resource Inventory), defining Cedar River Watershed restoration efforts in the context of biodiversity, and identifying research and monitoring priorities that will support Watershed restoration efforts. To identify and further develop biodiversity management tools, SPU plans to conduct one or more workshops focused on assessment, restoration, and monitoring of species diversity using funds from the BPA mitigation program. The workshops will focus on the Cedar River Municipal Watershed as a case-study in restoring species diversity to Pacific Northwest forested ecosystems. No specific biological diversity studies are planned for 2005; however, documentation of biodiversity data stemming from other studies will continue.

Financial Summary

This is not an explicit HCP Cost Commitment. Thus, there is no financial summary for this activity.

HCP Program Element: HCP Volunteer Involvement Program
HCP Program Category: Watershed Management

Contact: Clay Antieau, Senior Watershed Planner, Watershed Management Division

Objectives & Goals

Watershed staff support two volunteer programs: a docent program associated with the Watershed Education Center, its collections/displays, and its visitors; and a "Habitat Conservation Plan (HCP) Implementation" program focusing on projects in the Municipal Watershed. The Cedar River Watershed's HCP Volunteer Program uses volunteers and "conservation corps" to assist Division staff in implementing HCP elements in the Watershed. As with most citizen-involvement initiatives, Municipal Watershed managers use this Volunteer Program to renew citizens' commitment to their own communities and resources while benefiting from that volunteer assistance. Thus, essentially all events in which volunteers participate are designed and managed to provide distinct educational, training, or development opportunities to those volunteers.

Status of Work (HCP Volunteer Program 2004 Accomplishments)

- The Program involved approximately 218 volunteers in the mission, management, and ecology of the Cedar River Municipal Watershed.

- The Program generated approximately 1065 hours (133 person-days) of volunteer effort.

- The Program partnered with at least eleven partner organizations: Friends of the Cedar River Watershed, EarthCorps, Microsoft, Recreational Equipment Inc., Boeing, Bank of America, Bonneville Power Administration, Eastside Catholic High School, Highline School District, Camp Wascowitz, and Mountains-to-Sound Greenway.

- The Program managed approximately 4.5 acres for invasive alien plant species [Japanese knotweed (*Polygonum cuspidatum* complex) on portions of abandoned Road 16 and along Masonry Pool; tansy ragwort (*Senecio jacobaea*), along the 9 Road; Scots broom (*Cytisus scoparius*) at the Masonry Pool and at the Rattlesnake Lake Recreation Area].

- The Program planted approximately 1927 conifers and other native plant species in the Upper and Lower Watershed areas on abandoned forest roads, in the riparian areas of streams and wetlands, and in the understory of ecological forest thinning areas.

- The Program rebuilt and improved 0.25 mile of interpretive trail at Chester Morse Reservoir.

- The Program constructed one grade control structure (unnamed tributary, 10/12 road junction).

Looking Ahead (Planned 2005 Accomplishments)

The HCP Volunteer Program will continue in 2005 with major tasks focused on biological inventory, invasive plant species management, slash removal, and revegetation.

Financial Summary

This is not an HCP Cost Commitment; thus, there is no financial summary for this activity.

HCP Program Element: Watershed Road Decommissioning (C100026)
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed Management Division

Objectives and goals

To reduce the road network to a long-term core road system of approximately 384 miles, the City will remove approximately 236 miles of roads (about 38 percent of the original total), and expects to average about 10 miles of roads per year for the first 20 years of the HCP. The primary purpose of road decommissioning is to minimize sediment delivery to streams and to improve drainage patterns. Decommissioning also will reestablish fish passage between significant amounts of habitat. The basic principles of road deconstruction are to restore the site to approximate pre-road functioning and stability, which involves restoring drainage, placing material in stable locations, and controlling surface erosion. Mineral soils and organic debris are removed from "perched" or otherwise unstable locations and placed either in the roadbed against the cutbank, or hauled to a suitable waste site where they will not be likely to fail and deliver sediment to streams. Culverts are removed. Stream crossings are restored, and stabilized with grade control to avoid eroding into the hillslope. Constructing frequent waterbars across the road surface is done to restore cross-slope drainage. All disturbed soils are treated with an approved seed mix and protected with an application of straw or brush to reduce surface erosion. We have had a lot of success with self-seeding of trees, and have occasionally planted seedling trees on deconstructed roads. Some of the roads slated for deconstruction may pass inspection for long-term stability of material and drainage, and may not require any work before declaring them "decommissioned."

Status of work (2003)

In 2004 we abandoned 9.1 miles of road network. The following road sections were abandoned: 613, 615&1/9, 615, 616, 617.5, 617, 618, 640A, 641A1, 641, 641.1, Little Mountain Spurs, 62.2, 62.3, 71, 610.1, 610.1a1, 610.1a3, 610.1c, 610.4a, 610.4b, 610.B1, 610B, 611a, 611, and 612 roads. These roads were removed because they were determined to be nonessential for the management of the watershed. Roads were abandoned by removing drainage structures (culverts), managing the water crossing the road prism by installing water bars, and removing any unstable fill material and moving it to a new stable location. In some situations this involved hauling the material to a stable location within the watershed. Road decommissioning projects were linked with other HCP aquatic restoration projects (streambank stabilization and streambank revegetation) whenever possible to increase the ecological benefit of removing the road.

Looking ahead (Planned 2005 Accomplishments)

In 2005, we plan to decommission approximately 10 miles of roads. We will also inspect some roads that were identified in the road inventory process as undriveable for potential decommissioning.

Financial summary

The HCP commits funding of $5,9810,250 $5,981,250 for HCP years 1-20 (in 2004 dollars), averaging $301,250 per year (in 2004 dollars). A total of $395,532 was expended in 2004 for labor, equipment, materials, and related expenses.

Road Decommissioning			
HCP work Commitment	HCP Cost Commitment in 2004	HCP work Commitment, completed in 2004	HCP Cost Commitment spent in 2004
Decommission 10 miles of road/per year (average) thru 2020	$301,250 in 2004 (average)	Approximately 9.1 miles	$395,532

Program Element: Watershed Road Improvements (C100023)
Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed Management Division

Objectives and goals

The purpose of road improvements is to reduce sediment loading to streams and other water bodies over time. To minimize sediment delivery to streams and to improve drainage patterns, priority stream crossing will be upgraded, and ditches will be sized to control hillslope surface and groundwater flows and to protect the road from surface erosion. Cross-drains will be installed at frequent intervals to move hillslope surface and groundwater across the road in a pattern that approximates the drainage pattern upslope of the road, and unstable sidecast and fill material will be moved. A road may be stabilized by constructing a supported keyed fill or by reconstructing the cutslope. Road improvements include activities such as applying rock for stability, increasing frequency of cross-drains, stabilizing fills, removing unstable sidecast material and dismantling perched landings.

Status of work (2004)

In 2004 we completed approximately five miles of road improvements on the 200 Road, including culvert installations, road surfacing, ditching and road edge pullback. The 200 Road was re-aligned at Rack Creek to allow bank stabilization. Work was also done to develop a new road inventory system to support short-term, logistical planning to accomplish work in a cost-effective manner, and long-term prioritization and planning of road improvement, decommissioning, and maintenance work to meet HCP ecological objectives.

Looking ahead (Planned 2005 Accomplishment)

In 2005, we plan to continue improvements to the 200 Road, including slope stabilization with an MSE welded wire wall. We also plan to improve the 100 Road.

Financial summary

The HCP commits funding of $2,108,750 for HCP years 1-5 (in 2004 dollars), averaging $421,750 per year (in 2004 dollars). The full $421,750 was expended for labor, equipment, materials, and related expenses in year 2004 for road improvement.

Road Improvement			
HCP work Commitment	2004 HCP Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
Improve roads to reduce sediment delivery to stream and improve drainage	$421,750	Approximately 5 miles	$421,750

HCP Program Element: Watershed Road Maintenance (N541701)
HCP Program Category: Watershed Road Decommissioning & Improvements

Contact: Chris Anderson, Watershed Operations Manager, Watershed Management Division

Objectives and Goals

The primary objectives of road maintenance under the HCP are to minimize sediment delivery to streams, to improve drainage patterns that have been altered by roads, and to provide fish passage, following standards included in the HCP. These standards are designed to maintain a stable, functional road system that minimizes adverse impacts on stream and riparian habitat. The focus is on road segments that are near streams or have the potential to deliver sediment to streams. Other areas are now maintained with more precautions and added cost to protect draws and water crossings.

Status of Work (2004)

In 2004 we accomplished approximately 42 miles of road maintenance on particular roads that have potential to impact the aquatic system. Increased care and time is spent on grading and compacting road surfaces that have potential to impact aquatic habitat.

Looking Ahead (Planned 2005 Accomplishments)

We will continue road maintenance activities to protect and benefit habitat. In 2005, we plan to continue maintaining HCP Roads that are not immediately scheduled for Road Improvements. With emphasis on data collected from the Road Inventory, we will continue to identify roads for the HCP maintenance standards. One of our goals in 2005, in addition to maintaining HCP roads, is to distinguish HCP maintenance objectives from normal road maintenance. This has been an ongoing procedure using planning and mapping tools.

Financial Summary

The HCP commits funding of $563,9900 $563,990 for HCP years 1-5 (in 2004 dollars), averaging $112,788 per year (in 2004 dollars). A total of $93,524 was expended in 2004 for labor, equipment, materials, and related expenses for HCP road maintenance.

Road Maintenance			
HCP work Commitment	HCP Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment spent in 2004
Maintain roads to correct and avoid direct road impacts to streams	$112,788 In 2004	Approximately 42 miles plus 5 miles paid by BPA	$93,524

HCP Program Element: Large Woody Debris Replacement in Streams (C100019)
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives and Goals

The objective of this element is to temporarily enhance stream habitat by placing large woody debris (LWD) in selected streams that lack wood as a result of past land management activities. The goal is to help restore ecological functions by enhancing in-channel structural characteristics. This will temporarily improve fish habitat until the adjacent riparian area begins to supply woody debris of appropriate size and quantity.

Status of Work (2004)

The 2004 LWD project on Rock Creek consisted of placing 50 LWD pieces using a hand cable system to move logs up to 24 inches in diameter and 32 to 40 feet in length into a 500-foot reach 300-foot upstream of the 10 Road crossing. LWD pieces will also be placed in the floodplain to address channel migration issues and riparian restoration objectives. An Earth Corps crew, three Watershed Operations staff, and three Watershed Ecosystems staff completed the work in two weeks.

Looking Ahead (Planned 2005 Accomplishments)

We plan to restore up to approximately 3,500 feet of sections within geomorphic management unit (GMU) 9 of Rock Creek to their natural range of conditions for LWD distribution between the 40 Road and the 10 Road using a variety of placement techniques, including helicopter, cable yarder, forwarder, and hand cable systems.

Financial Summary

The HCP commits funding of $120,496 (in 2004 dollars) for HCP years 1- 8. Approximately $17,489 was spent in 2004 completing two projects.

Large Woody Debris Replacement			
HCP work Commitment	HCP 2004 Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
1.6 LWD projects per year (average)	$15,063 per year (average)	One 500 ft long project that installed 54 pieces of wood was completed in 2004	$17,489

HCP Program Element: Streambank Stabilization (C100017)
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives and Goals

The objective of this element is to minimize excessive rate of streambank erosion caused by forest roads and land management activities. The goal is to improve storm water quality and reduced magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement.

Status of Work (2004)

Approximately 300 ft of the 200 road was moved up to 30 feet away from Rack Creek to allow for eroding road fill to be removed and reestablishment of a floodplain and placement of large woody debris in the channel. 2004 work consisted of road realignment away from Rack Creek.

Looking Ahead (Planned 2005 Accomplishments)

Complete road fill removal between the new road location and Rack Creek. This will create a floodplain and placement of large woody debris in the channel to improve stream bank stability and bull trout habitat.

Financial Summary

The HCP commits funding of $183,280 (in 2004 dollars) for HCP years 1-8. Approximately $43,344 was spent in 2004 to make up for previous years when less stabilization work was completed.

Streambank Stabilization			
HCP work Commitment	HCP Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
197 feet per year (average)	$23,800 per year (average)	Moved 300 ft of the 200 road away from Rack Creek.	$43,344

HCP Program Element: Streambank Revegetation (C100022)
HCP Program Category: Stream and Riparian Restoration

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives and Goals

The objective of this element is to revegetate streambanks where past upstream or upslope activities have altered the riparian vegetation to the point where excessive streambank erosion is occurring and channel stability has been reduced. The goal is to help restore ecological functions by recovery of vegetation characteristics. This will improve storm water quality and reduce the magnitude and frequency of disturbance to fish habitat from sediment inputs and bedload movement

Status of Work (2004)

Planting of streamside areas was conducted in Seattle and Goat Sub-basins during the fall of 2004 in order to accelerate the recovery of streambanks and associated riparian zones disturbed by road decommissioning work. Restoration efforts associated with streamside revegetation were tied to stream crossings on decommissioned roads, because these restored stream crossings tend to have extensive bare soils directly adjacent to streams, as well as adequate access necessary for the transport of numerous potted plants. Stream crossings along the 610.a, 617 ? and 641 Roads were planted with 143 shrubs and 66 trees during the fall of 2004.

Looking Ahead (Planned 2005 Accomplishments)

Streambanks with high impacts to the aquatic system will be planted in 2005. The projects will provide vegetative stability to redesigned channels to provide long-term stability at several road abandonment locations. The exact sections of streams to be stabilized will depend on the projected cost of the work and will be determined by the final design of the projects.

Financial Summary

The HCP commits funding of $63,8650 for HCP years 1-8 (in 2004 dollars). Approximately $4,081 was spent in 2004 for streambank restoration.

Streambank Revegetation			
HCP work Commitment	HCP 2004 Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
331 feet per year (average) of revegetated streambank	$7,983 per year (average)	Approximately 280 linear feet (6,400 square feet) with 209 native shrubs and trees	$4,081

HCP Program Element: Riparian Conifer Underplanting (C100018)
HCP Program Category: Stream and Riparian Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives and Goals

The objective of this element is to plant and reestablish conifers near streams and in forested areas around wetlands, ponds, and other non-forested aquatic habitats that were converted to hardwoods as a result of past land management activities. This conifer establishment will help accelerate the restoration of diverse and structurally complex riparian stands within the watershed and promote biodiversity in areas that were disturbed by early timber harvest activities.

Status of Work (2004)

In 2004, a riparian planting project was implemented along Rock Creek in the lower Cedar River Watershed, in conjunction with a large woody debris placement project. This project was installed in areas that were dominated by red alder overstory with a salmonberry understory. Watershed management division staff planned, designed and implemented the planting projects, and Earth Corps crews assisted with the site preparation and planting. A combination of western redcedar and Sitka spruce seedlings and various native shrubs were planted over 2.2 acres. Approximately 500 linear feet of riparian area was affected by these riparian planting projects.

Riparian vegetation monitoring, including follow-up monitoring at Webster Creek, Shotgun Creek and Taylor Creek, was also accomplished to track the success of these past riparian conifer planting projects.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, a riparian planting project will occur along Rock Creek, in conjunction with a Large Woody Debris Placement project. This planting will occur over approximately 800 linear feet of Rock Creek north of the 10 Road in the lower Cedar River Watershed. This area currently hosts an overstory of red alder and an understory of salmon berry.

Longer-term site selection and prioritization of areas to be planted will also occur during 2005 through the interdisciplinary team process. To inform future work, monitoring data will continue to be collected and analyzed that will allow us to assess planting methods, seedling survival, and variety of techniques used in riparian underplanting projects.

Financial Summary

The HCP commits funding of $59,160 60,240 for HCP years 1-8 (in 2004 dollars), with an average of $7,390 7,530 per year (in 2004 dollars). In 2004, $7,100 was expended for plant materials, Earth Corps crews, and staff time during planting projects and monitoring.

HCP Program Element: Riparian Restoration Thinning (C100020)
HCP Program Category: Stream and Riparian Restoration

Contacts: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives and Goals

The objective of this element is to conduct restoration thinning (in forests under 30 years old) and ecological thinning (in forests over 30 years old) within previously disturbed riparian zones of streams, open water bodies, and wetlands. Riparian thinning will accelerate tree growth and forest structural development, provide greater protection for streams and eventually develop forest structure, composition, and diversity characteristics similar to those of natural mature riparian conifer forest originally on the site. Thinning is focused on stands with high tree density and involves cutting trees to a desired spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Thinning in riparian areas also focuses on retaining high tree species diversity, including conifer and hardwood trees and shrubs. In the long-term, riparian thinning will benefit adjacent aquatic ecosystems as the forest contributes shade, large woody debris, stream bank stability, and nutrients.

Status of Work (2004)

In 2004, riparian restoration thinning was conducted along Seattle Creek (37 acres) and Troublesome Creek (8 acres) in the upper watershed in association with upland restoration thinning. Restoration thinning contractors implemented this project, and staff conducted compliance monitoring concurrently.

Additionally, staff, through an interdisciplinary team effort, continued to develop a project site selection and prioritization strategy for riparian thinning projects through year 2016.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, three types of riparian thinning projects will occur. First, there will be a small riparian ecological thinning project along Shotgun Creek, wherein snags will be created in order to kill a portion of the overstory trees. No trees will be removed from the site. Second, approximately 33 acres bordering an unnamed wetland adjacent to the 76 Road will be thinned to improve wetland associated habitat conditions. This project will be planned by an interdisciplinary team, highlighting wetland habitat function. Finally, roughly 15 acres of young, dense riparian forest will be thinned in association with upland restoration thinning in the upper watershed. Strategic planning will continue regarding selecting and prioritizing sites for both riparian restoration and ecological thinning.

Financial Summary

The HCP commits funding of $53,240 for HCP years 1-8 (in 2004 dollars), with an average of $6,660 per year. A total of $7,041 was expended for contractors to implement thinning. Staff time to conduct associated monitoring and long-term planning were additional expenditures.

HCP Program Element: Stream Crossings for Peak Flows (C100016)
HCP Program Category: Aquatic and Riparian Restoration

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Management Division

Objectives and Goals

Stream crossing projects are designed to improve drainage patterns that have been altered by roads, to minimize sediment delivery to streams and achieve channel stability at that particular site. There are approximately 1,300 stream crossing structures on non-fish-bearing streams in the Cedar River Watershed. Many of these crossings need to be upgraded regarding size or alignment, except where the road is deconstructed, for which culverts are removed. A few crossings will need relatively expensive repairs.

Status of Work (2004)

In 2004, stream crossing for peak flow work was completed in a number of areas: staff installed four 36" culverts on the 30 Road and replaced one culvert each on the 50 and 70 Roads. All of these stream crossings were upgraded to accommodate peak flow conditions and to reduce sediment delivery to streams. Design was also completed for the 2005 project to replace the crossing at Eagle Creek on the 100-300 Road. During culvert inventory collection, several locations were identified for future improvement projects. A consultant was hired to design some of these improvements.

Looking Ahead (Planned 2005 Accomplishments)

As part of the 2005 peak flow crossings, we are planning to finish one large stream crossing: the undersized culvert at Eagle Creek will be replaced with a small bridge. This is the lowest cost appropriate solution for this location. The existing crossing has had repeated problems with washing out and delivering sediment into the stream. Bull trout are present, but have been able to pass through the existing culvert, so it is not a fish passage project, although the new structure will continue to pass fish.

Financial Summary

The HCP commits funding of $150,640 for HCP years 1-8 (in 2004 dollars), averaging $18,830 per year (in 2004 dollars). The full $18,830 was expended in peak flow work during 2004 for labor, equipment, materials, and related expenses was spent in year 2004.

Stream Crossings for Peak Flows			
HCP work Commitment	2004 HCP Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
Improve passage of peak flows at road crossings	$18,830	6 crossing locations	$18,830

HCP Program Element: C100021, Stream Crossings for Fish Passage (C100021)
HCP Program Category: Aquatic and Riparian Restoration

Contact: Marti Spencer, Watershed Engineering Supervisor, Watershed Management Division

Objectives and Goals

Stream Crossing improvements are designed, where it is economically and technically feasible, to reestablish fish passage in locations where road crossings interrupt connectivity between significant habitat for resident or anadromous fish. One of the most cost-effective strategies for fish habitat restoration can be to restore access to habitat by upgrading, replacing and removing blocking culverts on fish-bearing streams. Removal of artificial migration barriers can restore biological connections between upstream and downstream populations. Fish production can increase with restored access to spawning and rearing habitat.

Status of Work (2004)

In 2004 we completed a fish passage project installing an arch culvert crossing at Carey Creek tributary on the 19 Road. We completed design for Bear Creek tributary on the 600 Road, and purchased the bridge, which will replace the puncheon culvert and deep fill. We completed a plan to restore fish passage in Webster Creek at the Taylor Ditch siphon.

Looking Ahead (Planned 2005 Accomplishments)

In 2005 we plan to install the bridge at Bear Creek tributary, and restore fish passage at Webster Creek. We will be looking at the current list of fish blockage locations and prioritizing future projects.

Financial Summary

The HCP commits funding of $1,156,800 for HCP years 1-8 (in 2004 dollars). The cost commitment for 2004 was $144,600 in 2004 dollars. A total of $141,600 was expended in 2004 for labor, equipment, materials, and related expenses for stream crossings for fish passage. These crossings are usually high-cost, individual projects that must be completed in one construction season. Expenditures are likely to be high in some years. Other years will concentrate on design and these years may have lower expenditures.

Stream Crossings for Fish Passage HCP work Commitment HCP 2004 Cost Commitment HCP work Commitment, completed in 2004 HCP Cost Commitment, spent in 2004 Removal of road barriers to fish movement $144,600 per year (average) 1 project and purchase of one crossing structure $141,600

HCP Program Element: Upland Restoration Thinning (C100024)
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives and Goals

The objective of this element is to use thinning in young upland forests (generally less than 30 years old) to accelerate development of late-successional and old-growth forest conditions, to develop habitat that supports diverse native wildlife, and to reduce the chance of catastrophic damage to the forest through wildfire, insect outbreaks, or diseases. These young forests have developed as a direct result of commercial timber harvest that occurred within the watershed during the past several decades. They often have a very high density of trees, which results in intense competition for light, water, and nutrients. Restoration thinning involves cutting trees to a desired pattern of spacing to promote more rapid tree growth, improve current habitat, and accelerate the development of older forest characteristics. Because the relative value of restoration thinning diminishes as a stand ages, efforts in HCP years 1-16 will focus on thinning large areas of very high tree density.

Status of Work (2004)

In 2004, approximately 650 acres were restoration thinned primarily in the upper watershed, which is dominated by the Pacific silver fir forest type. Staff designed restoration thinning unit locations and boundaries through a landscape analysis approach, and units included young forest of different ages and species compositions. The restoration thinning prescriptions were developed by an interdisciplinary team and were designed to leave existing large trees and retain diverse species. Three different treatments were applied in 2004. Effectiveness monitoring occurred in each of the treatment types to provide base-line data for future monitoring and adaptive management. Compliance monitoring was conducted concurrently with the thinning implementation. A small amount of surveying was performed to identify and mark City ownership boundaries for 2004 and 2005 restoration thinning work.

Also in 2004, Seattle Public Utilities partially funded a Master's thesis research project investigating the Pacific silver fir forest development patterns. The results of this research will inform decisions about forest tree density and spatial patterns in the restoration thinning program. This research evaluated spatial patterns in old-growth Pacific silver fir forests in the watershed and their correlation to competition among trees.

Looking Ahead (Planned 2005 Accomplishments)

Approximately 800 acres will be thinned in 2005. Varied prescriptions will be implemented on young forests in the upper watershed. Compliance monitoring will be conducted while the thinning is implemented. Effectiveness monitoring activities will document forest stand characteristics before and after thinning to establish baseline information for future effectiveness monitoring and adaptive management. Planning for 2006 restoration thinning areas will occur. The program manager and the interdisciplinary team will continue consulting with forest restoration experts to develop the most effective approaches to young forest thinning to accomplish HCP objectives. Computer growth models will also be used to investigate different approaches and their outcomes. Strategic planning and watershed characterization will continue regarding selecting and prioritizing sites for restoration thinning in the watershed.

Financial Summary

The HCP commits funding of $1,909,560 for HCP years 1-8 (in 2004 dollars), with an average of $238,700 per year. A total of $127,469 was expended on restoration thinning, surveying and forest development research in 2003. Effectiveness monitoring and compliance monitoring by staff were additional expenditures.

HCP Program Element: Upland Ecological Thinning (C100027)
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives and Goals

The objectives of this element are to use ecological thinning in forests greater than 30 years old to accelerate the development of characteristics associated with older forests, increase biological diversity, facilitate ecosystem function, and reduce the risk of catastrophic events, such as wildfires, insect outbreaks, or diseases. Ecological thinning may use a variety of silvicultural techniques, including variable density thinning and gap and snag creation, and it is focused on stands with relatively high tree density and little structural complexity. Thinning will remove trees to create variable spacing in the remaining forest, retain and develop large trees and trees of varied height and diameter, increase species diversity, and encourage structural complexity. The HCP provides that trees can be removed from an ecological thinning site after the ecological objectives have been met. These surplus trees may be sold under ordinance authority.

Status of Work (2004)

An interdisciplinary project team delivered for stakeholder review a draft plan for the 700 Road Forest Restoration Project, the second ecological thinning project proposed in the watershed (review by outside experts had been conducted in the fall of 2003). This plan outlined the ecological objectives and silvicultural prescriptions for the project area. Implementation of the plan was delayed in 2004 in order to engage in a stakeholder consultation process. The highlight of this process was a Forest Restoration Workshop, which SPU hosted primarily for members of the environmental community. The workshop was successful in sharing our restoration objectives under the upland forest restoration program in general, and the 700 Road Forest Restoration Project in particular. Diverse environmental organizations were represented, as was the Muckleshoot Indian Tribe. A professional facilitator was hired to plan for, facilitate, and bring closure to the workshop. The interdisciplinary project team proceeded to incorporate questions and comments into the 700 Road project plan and continued working with stakeholders through the year.

Looking Ahead (Planned 2005 Accomplishments)

If the associate ordinance is approved by the Seattle City Council and the Mayor, the 700 Road Forest Restoration Project will begin to be implemented in 2005. Along with contract administration, effectiveness monitoring and compliance monitoring will be conducted for this project. Additionally, portions of the Taylor Creek sub-basin will be inventoried by a consultant to generate forest habitat data from which new ecological thinning project sites may be selected. According to the draft Upland Forest Restoration Strategic Plan, the Taylor Basin is one of the highest priority areas for ecological thinning to improve habitat connectivity between the upper and lower watershed, and this area is on the list for near-term projects.

Financial Summary

The HCP commits funding of $295,780301,280 for HCP years 1-8 (in 2004 dollars), with an average of $36,97037,660 per year (in 2004 dollars). A total of $2,166 was expended as cost commitment in 2004 for professional facilitation of the Forest Restoration Workshop. Staff time in preparing and conducting the workshop was an additional cost. This activity was under expended because work was focused on the stakeholder process rather than project implementation.

HCP Program Element: Upland Restoration Planting (C100025)
HCP Program Category: Upland Forest Restoration

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Objectives and Goals

The objective of this element is to restore species diversity and ecological complexity through restoration planting in upland forest ecosystems. Restoration planting will benefit forest biological diversity by increasing plant community diversity to a level similar to that found in naturally regenerated forests on comparable sites. For example, enhancing the hardwood component in forests currently dominated by conifer trees will increase stand structural complexity and support more diverse wildlife and epiphytic plant species. Planting may include trees, shrubs, and forbs, as well as flora such as lichens and mosses. Projects will be monitored, data analyzed and techniques changed to increase understanding of how desired objectives can be achieved. Upland restoration planting projects will often be integrated with other HCP projects, such as ecological and restoration thinning.

Status of Work (2004)

Plans for planting trees, shrubs, and non-traditional flora were being developed conjunction with the 700 Road Ecological Thinning project, originally scheduled to be implemented in 2004 but now scheduled for 2005. Strategic planning continued regarding selecting and prioritizing sites for upland restoration planting in the watershed, assessing the presence and diversity of various non-vascular and rare plant species in the forest ecosystem, and experiment with planting these non-vascular and rare species to increase ecosystem function and biodiversity.

Looking Ahead (Planned 2005 Accomplishments)

Two projects will be initiated in 2005, in addition to planting in conjunction with the 700 Road Forest Restoration Project,. The first will be a planting trial in the lower watershed to test which native shade-tolerant species will be able to grow well in Douglas-fir/salal forest type. These forests often occur on droughty, glacial outwash soils, and the salal understory presents vigorous competition. Native trees and shrubs will be included in the trial. The second project will be a western white pine seed source identification and collection program within the watershed. Over one-hundred years ago, the native western white pine succumbed to an exotic disease, white pine blister rust. Western white pine is drought tolerant and root rot resistant and is a good species to plant in the above mentioned sites. However, local seed source is nearly impossible to find. A few mature western white pine are known to occur in the watershed. The locations of these trees will be identified and they will be assessed for potential seed cone collection. Once cone crops are harvested, local nurseries will be contracted to grow the seeds to plantable seedlings.

Financial Summary

The HCP commits funding of $88,730 for HCP years 1-8 (in 2004 dollars), with an average of $11,090 per year. No cost commitment dollars were spent on upland restoration planting in 2004, as the planting project in conjunction with the 700 Road Forest Restoration Project was delayed.

HCP Program Element: Long-Term Stream and Riparian Monitoring and Research (N541802)
HCP Program Category: Aquatic Monitoring and Research

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives and Goals

The goal of the long-term stream and riparian monitoring and research program is to evaluate the overall ecological response of the watershed to HCP management activities. This program will monitor stream health, document recovery from past water supply and land management operations, and help identify any impacts of the City's operations on stream ecosystems for the duration of the HCP.

Status of Work (2004)

We developed monitoring questions consistent with desired future conditions for different geomorphic units (GMUs). We began development of a long-term monitoring plan and determining linkages between project monitoring and long-term stream and riparian monitoring. We consulted with NOAA Fisheries on watershed scale monitoring and the use of ranked sampling in a long-term monitoring program. We also completed a memorandum of agreement (MOA) with the USGS to determine the best use of benthic macroinvertebrates to meet the long-term HCP monitoring objectives.

Looking Ahead (Planned 2005 Accomplishments)

We plan to determine the best use of benthic macroinvertebrates for answering monitoring questions, and to complete a long-term stream and riparian monitoring program plan. We also plan to complete benthic macroinvertebrate sampling, and to conduct other aquatic/riparian long-term sampling.

Financial Summary

The HCP commits funding per year of the long-term stream monitoring and research program up to $65,070 per year (in 2004 dollars) in years of intensive data collection. In most years this would not be the case, and the cost would be proportionally less. Approximately $8,154 was spent in 2004 for long-term monitoring.

Streambank Revegetation			
HCP work Commitment	HCP 2004 Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
Long-term stream and riparian monitoring program.	Up to $65,070 per year	Completed MOA with the USGS. Developed monitoring questions.	$8,154

HCP Program Element: **Monitoring of Aquatic and Riparian Projects (N541803)**
HCP Program Category: Aquatic Monitoring and Research

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives and Goals

Aquatic and Riparian project monitoring goals and objectives are to track compliance with and the success of specific projects implemented through the conservation strategies for the aquatic and riparian ecosystem. The monitoring is intended to record the efforts and results of these conservation and mitigation measures, to assess their effectiveness in improving affected aquatic and riparian functions, and to provide information for adaptive management and project modification.

Status of Work (2004)

We completed pre- and post-project monitoring on the 2004 Rock Creek LWD project. We also developed monitoring questions consistent with desired future conditions for appropriate geomorphic units (GMUs). We began development of an aquatic project monitoring plan and determining linkages between project monitoring and long-term stream and riparian monitoring.

Looking Ahead (Planned 2005 Accomplishments)

We plan to complete pre- and post-project monitoring on the 2005 Rock Creek LWD project, post-project monitoring of the 2002 Lost Creek LWD project, and post-project monitoring of the 2002 Shotgun Creek LWD project. We also plan to complete pre- and post-project monitoring on the 200 road Rack Creek streambank stabilization project, and to complete an Aquatic and Riparian monitoring program plan.

Financial Summary

This monitoring program may cost up to $30,130 per year in HCP years 4-6 (in 2004 dollars). Approximately $6,890 was spent in 2004 for Aquatic and Riparian project monitoring.

Streambank Revegetation			
HCP work Commitment	HCP 2004 Cost Commitment	HCP work Commitment, completed in 2004	HCP Cost Commitment, spent in 2004
Stream and riparian project monitoring program	Up to $30,130 per year (average)	2004 Rock Creek LWD project pre- and post-project monitoring. Plan development.	$6,890

HCP Program Elements: **Bull Trout Spawning Surveys (N541805)**
Bull Trout Fry/Juvenile Surveys (N541806)
Bull Trout Stream Distribution Surveys (N541809)
Bull Trout Surveys (adult/weir) (N541804)
Bull Trout Redd Inundation Study (N541810)
Bull Trout Stream Telemetry Studies (N541807)
Bull Trout Lake Telemetry Studies (N541808)

HCP Program Category: Watershed Aquatic Monitoring and Research

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Objectives and Goals

Document the overall distribution of bull trout spawning habitat within the Cedar River Watershed (CRW) and monitor long-term trends in the annual level of spawning activity in "core" spawning habitat as an index of the status of the adfluvial bull trout population in the Chester Morse Lake drainage basin.

Document the basic behavior patterns of bull trout fry (e.g., emergence/outmigration timing), evaluate spring "fry counts" as a potential index of the adfluvial bull trout population and habitat use, and determine the distribution of juvenile rearing habitat within the CRW.

Document the overall extent and distribution of major stream and tributary habitat used by bull trout (all life history stages/forms) within the CRW in order to facilitate development of the most effective management prescriptions for protection and/or enhancement of bull trout habitat under conservation and mitigation strategies of the HCP.

Status of Work (2004)

Bull trout spawning surveys
Numbers of bull trout redds located during recent years have varied widely as a result of natural bull trout behavior, stream flow conditions (i.e., high flows), and staff time available to conduct surveys. During the 2000 season, however, relatively low river flow conditions were ideal for conducting spawning surveys, and additional HCP staff was available to conduct more intensive surveys. A conservative total of 236 redds were observed within the Chester Morse Lake drainage basin ('core' spawning reaches), which was more than double the previous high count of 111 redds. In the 2001 season, staff again observed a conservative total of 236 redds within the Chester Morse Lake drainage basin. Based on information from other studies, the number of bull trout redds observed in two consecutive seasons appear to fall well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size. Spawning activity was also observed in some side-channel reaches where spawning activity had not previously been documented. Also, the spawning season in 2001 extended into mid-January, approximately four weeks longer than previously documented, and a similar pattern was observed in 2002.

Data collected by Fish and Wildlife Unit staff indicate that the adfluvial bull trout population present in Chester Morse Lake spawned in record numbers in 'core' spawning reaches of major lake tributaries during fall/early winter (September – January) of 2002-03. Despite experiencing near record low flow levels in the Cedar River and other major spawning streams in the watershed, as well as unusually low reservoir levels (i.e., 'drought' conditions) in Chester Morse Lake, bull trout were able to pass potential barriers at the confluence with the lake and find adequate gravel and flow conditions in traditional spawning reaches. The highest previous bull trout redd counts in 'core' spawning reaches prior to this

season's survey were 236 redds in both 2000 and 2001. This number was more than doubled in 2002-03 with a count of 504 redds.

2003-04 data collected by biologists indicate that the adfluvial bull trout population present in Chester Morse Lake spawned at a level similar to those documented in HCP years 1-3 (see above). Surveys conducted in 'core' spawning reaches of major lake tributaries during fall/early winter (September – January) of 2003-04 resulted in a total of a total of 258 redds recorded. This total is very similar to the non-drought years of 2000 and 2001 when a total of 236 redds was recorded in each year. Information of this type, collected over the long-term and under a variety of environmental conditions, is necessary to understand habitat requirements of this 'threatened' species and to make informed management decisions in order to protect this 'unique' population of bull trout and its habitat in the municipal watershed. Again, for the fourth year in succession, the number of bull trout redds observed in 2003-04 falls well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size.

Staff biologists also invested considerable effort to incorporate pre-HCP redd survey location data into the current database format, perform QA/QC on the data entered, and link the database to the Watershed Management Division GIS system to facilitate long-term trend and statistical analysis, GIS mapping, and the development of other GIS-based materials. These tools will soon be used to evaluate the technique relative to its potential as an index to bull trout population status in the lake, whether it should be modified to be more effective and efficient as a monitoring technique, or whether it should be replaced with other more effective methods in future years. Discussion(s) are planned with the Services to present this information and address associated issues.

2004-05 data collected by staff biologists indicate that the adfluvial bull trout population present in Chester Morse Lake spawned at a level exceeding those documented in HCP years 1-4 (see above). Surveys conducted in 'core' spawning reaches of major lake tributaries during fall/early winter (September – January) of 2004-05 resulted in a total of a total of 587 redds recorded. This total is the highest redd count recorded during the 5 years of intensive survey since implementation of the HCP, exceeding the previous high count of 504 (2002-03). Overall timing of spawning in 2004 (i.e., late September-early January) was consistent with previous years, however, early season 'spikes' of activity were observed, presumably due to lower early season water temperature, as compared with previous years. Spatial distribution of redds also varied somewhat from previous years in that a relatively greater proportion of redds were located further upstream in the respective streams than in some previous years, presumably due to generally higher reservoir levels during much of the spawning season.

The consistency of redd counts (i.e., 236-587) recorded over the initial 5-year period of the HCP and the fact that the counts continue to fall well within the range of numbers of redds that would be predicted for a viable, adfluvial bull trout population of this size supports the current assessment that the existing population is both viable and 'healthy'.

Bull trout fry and juvenile surveys

Two experimental techniques have been used to investigate the seasonal timing of bull trout fry behavior and production in the Chester Morse Lake drainage basin. In the early 1990s, fyke nets were deployed at selected locations on the mainstem Cedar and Rex rivers to determine seasonal timing of fry movement and outmigration in mainstem reaches, indicating peak movement levels from mid- to late April. During 2000, 2001, 2002, 2003, and 2004 periodic surveys (direct observation) of bull trout fry have also been conducted in selected mainstem and side-channel reaches of the Cedar and Rex rivers, as well as in selected tributary streams (e.g., Boulder, Cabin, Eagle Ridge, and Morse Creeks) to document habitat use and general fry behavior, and to identify general trends in the relative number of bull trout fry present in the tributaries of Chester Morse Lake from year to year. This technique is

experimental at present and will be evaluated for possible use as an index to monitor annual bull trout fry production under the HCP. The presence of fry was also observed in some side-channel reaches where rearing activity had not previously been documented. Observations of fry in some reaches also indicated earlier dates of emergence and movement in streams than previously documented in this system.

Although a database of fry capture and observational data has been maintained, both prior to and since implementation of the HCP, only basic, within year analyses were meaningful to perform. As data are collected in successive years, however, it becomes more practical to perform more extensive analyses of such data in terms of trends and relevance to variable environmental conditions. As with the spawning survey database (see above) staff biologists also invested considerable effort to incorporate pre-HCP and early HCP fry observation survey data, including locations, into the current database format, perform QA/QC on the data entered, and link the database to the Watershed Management Division GIS system to facilitate long-term trend and statistical analysis, GIS mapping, and the development of other GIS-based materials. These tools will soon be used to evaluate the technique relative to its potential as an index to bull trout population status in the lake, whether it should be modified to be more effective and efficient as a monitoring technique, or whether it should be replaced with other more effective methods in future years. Discussion(s) are planned with the Services during 2005 to present this information and address associated issues.

Bull trout stream distribution

The Chester Morse Lake bull trout population was conservatively estimated to be approximately 3,100 fish, and general distribution within the lake was documented in 1995 (R2 Resource Consultants, 2001). The full extent of the distribution of bull trout in tributary streams is currently incomplete. The presence of bull trout has, however, been documented in the mainstem of the Cedar River upstream from Chester Morse Lake, 0.7 mile into the North Fork to a natural barrier (falls) and also 0.7 mile into the South Fork to a partial seasonal barrier. The presence of bull trout has also been documented in Eagle Ridge Creek (a rearing area) and in several floodplain channels in the Cedar drainage. In contrast to the rainbow trout distribution within the lake basin, bull trout (or redds) have only been observed in three of the smaller tributaries to the reservoir complex (i.e., Rack Creek, Shotgun Creek, and Damburat Creek (single observation)). Bull trout have not yet been found in certain major tributaries of the Cedar River including Bear Creek, which is accessible and rainbow trout are present. Within the Rex River system, bull trout have been observed upstream in the mainstem as far as the confluence of Lindsay Creek, in Boulder Creek and Cabin Creek (spawning/rearing), and in Morse Creek and Lindsay Creek (rearing only). Observations during 2000-02 (see above) increased the known distribution of spawning and rearing habitat, but limited surveys in a few selected reaches did not extend the overall known range of bull trout within the watershed.

Surveys in several streams during 2002 extended both the known range of bull trout presence and life stage habitat use within the basin. The known presence and distribution of both bull trout spawning and rearing habitat was extended in Rack Creek, a small tributary to Chester Morse Lake. The overall distribution range and specific use of additional rearing habitat was also confirmed in upper Boulder Creek and in a small side-channel of the mainstem Rex River. Surveys in selected reaches of two other major tributary streams (South Fork Cedar and Bear Creek), thought to have substantial habitat suitable for bull trout and previously surveyed, again failed to detect the presence of bull trout.

No fieldwork relative to bull trout distribution was conducted during 2003 because of competing non-HCP workload levels (BPA project construction). The efforts of staff biologists, however, were focused on consolidating bull trout and other fish species information in consistent database format(s) and making the overall fish distribution database more contiguous in order to facilitate future analyses. Such analyses will be used to plan field survey work in 2004 intended to complete the first phase of bull trout distribution surveys in the watershed.

Currently, the distribution of bull trout within the upper Cedar River basin is well documented and most habitat has been evaluated in terms of its potential function as either spawning or rearing habitat for respective life stages. The presence of bull trout has been confirmed in almost all tributaries where they would be predicted to exist based on the existence of access and type(s) of habitat present. For those streams in which the presence of bull trout has not been confirmed (e.g., several small lake tributaries), substantial environmental constraints are consistently present limiting either access or survival of bull trout in the respective systems. Such constraints include annual subsurface flow in significant reaches, general poor quality (or absence) of spawning habitat, low/minimal flow volumes affecting potential rearing conditions, lack of access at low reservoir levels, etc. Upper limits of bull trout distribution have been identified in almost all major tributaries, with few exceptions. In most of these cases, bull trout distribution has terminated at either impassable falls, impassable cascades, or impassable bedrock intrusions (no bull trout observed upstream of these formations).

Efforts to gain further knowledge of bull trout distribution within the drainage in 2004 were focused in two major tributaries of the Cedar and Rex river drainages, Bear Creek and Boulder Creek, respectively, where either the presence or upper limit of bull trout distribution had not been identified. The presence of bull trout, both spawning and rearing, has been known in Boulder Creek for several years, but the upper extent of use had not been documented. Efforts in 2004 significantly extended the upper limit of use (e.g., juvenile rearing), but did not definitively identify the upper limit of access (potential cascade barrier).

Bear Creek is fish-accessible from the mainstem of the Cedar River, and some low level of use by bull has seemed probable, although habitat quality, especially for spawning, is marginal at best. Although all accessible habitat in Bear Creek (downstream of an impassable barrier) had been surveyed (e.g., by minnow trapping and electro-fishing) several times over a period of several years, no bull trout had been observed, although the presence of rainbow trout was documented at low densities.

In 2004, however, bull trout were detected in Bear Creek for the first time. Several juveniles were observed at one site a short distance upstream from the confluence with the mainstem Cedar. The presence of these juvenile bull trout in close association not only confirmed the presence of bull trout in Bear Creek, but also the possibility that some spawning (although likely very limited) may take place in lower reaches and indicates the value of further investigation.

Fish passage to reaches upstream of the lake perimeter forest road (200 Road) was restored at the Shotgun Creek crossing during late summer 2001 by removal of perched culverts and replacement with a pre-cast cement bridge. Installation of this structure provided potential access for both bull trout and rainbow trout from Chester Morse Lake to upstream reaches that had been previously inaccessible for decades. Initial monitoring to detect the presence of fish in newly accessible reaches was conducted during summer/fall of 2002, but no re-colonization of upstream reaches was detected. No monitoring for the presence/absence of fish was conducted in Shotgun Creek during 2003 because of competing non-HCP workload levels (e.g., BPA project construction). A major factor affecting the rate of re-colonization of upstream reaches is the fact that the entire stream reach from the confluence with Chester Morse Lake to the bridge typically exhibits subsurface flow conditions on an annual basis. Upstream reaches, however, typically remain wetted with moderate flow. The especially low flow and/or dry condition during 2002 may have severely constrained the ability of either species to reach the newly accessible habitat. This constraint may delay the re-colonization of upstream reaches for an undetermined period of time. Also, until fish re-establish residency in upstream ‘refuge’ habitat not affected by annual subsurface flow conditions, the presence and/or absence of fish in downstream reaches will presumably continue to vary widely.

Several aspects of the Chester Morse Lake adfluvial bull trout population are ecologically 'unique', especially its isolation from anadromous influence over a substantial expanse of recent geologic time. As a result, the upper Cedar River Municipal Watershed (CRMW), encompassing critical habitat for this population, has been designated as the 'Chester Morse Lake Core Area' in the first draft of the Puget Sound chapter of the federal Recovery Plan for bull trout, soon to be submitted to the USFWS Regional Office in Portland, OR, for review. Because of the degree and extent of physical isolation of this population, the genetics of the population as a whole is of potential regional and evolutionary significance. In addition, the potential for local populations to have differentiated within the Cedar system also has implications from the perspectives of both reservoir (i.e., water supply) and land management within the watershed.

As one component of 'stream distribution', in order to address the issue of genetic structure and relationship of the Cedar population on both a local and regional basis, Fish and Wildlife Unit staff collected tissue samples from juvenile bull trout in tributaries of Chester Morse Lake (e.g., Rack Creek) and in the Cedar and Rex rivers and their tributaries (e.g., floodplain channels, Boulder Creek, Cabin Creek) during summer 2002. These samples will be analyzed during 2003 in order to develop a clear picture of bull trout genetics within the Cedar system and their potential relationship to other bull trout populations on both regional and evolutionary scales.

Bull trout DNA analysis

Preliminary results of DNA analyses performed in 2003-04 on bull trout tissue samples collected during 2002 corroborated the findings of a morphometric analysis of a sample of bull trout/Dolly Varden individuals from Chester Morse Lake performed in the early 1990s, which classified the population as 'bull trout' and not Dolly Varden. Additional analyses have detected genetic differences between bull trout in the Cedar and Rex rivers, Boulder Creek (tributary to Rex River), and Rack Creek (tributary to Chester Morse Lake). Final reports on these analyses are pending. This work was funded from sources other than HCP cost-commitment funds.

Bull trout redd inundation study

The initial phase of the bull trout redd inundation study (i.e., stream topographic surveys) was initiated in the Cedar and Rex rivers (core spawning habitat) during late 2003 to provide information to facilitate better evaluation of the potential risk of redd inundation during spring reservoir refill. Field work for this project phase will be completed in 2004-05, data will be processed, and additional work products will be developed to support planning of the second phase of the project (i.e., egg mortality experiments). Preliminary scoping for the egg mortality phase of the project, including a preliminary draft experimental design, was also completed during 2003-04.

Draft experimental design(s) for the study will be revised/expanded during early/mid 2005. An initial stage of the egg mortality experiment(s) project will be implemented in fall 2005, and monitored through the spawning, incubation, and emergence season in 2006. Relatively high reservoir levels during the 2004 bull trout spawning season, combined with a unusually high observed occurrence of redd super-imposition, would have significantly constrained experimentation with bull trout redds during the 2004 season. Current plans call for a second year of data collection in 2006-07.

Also, topographic surveys were completed in 2003 in an 'historic' reach of Boulder Creek immediately upstream of its confluence with the Rex River to support evaluation of this reach as potential spawning habitat for bull trout (out of the inundation zone), if flow were to be restored to the reach (as a additional benefit to the drainage system under HCP stream restoration activities). These data will be evaluated in 2005-06 in order to support evaluation of future potential restoration project(s) in this reach of Boulder Creek.

Bull trout adult surveys (weir)
A fish weir project was initially proposed as one potential method to obtain physical and behavioral data on the adfluvial bull trout spawning population accessing habitat in the major tributaries of Chester Morse Lake (Cedar and Rex rivers), as well as to efficiently support (e.g., fish capture) other HCP monitoring and research projects, such as lake and stream telemetry and redd inundation studies. At least two factors have recently come to light, that in combination, make it advisable to at least temporarily delay and reevaluate the ecological risks (and logistics) associated with this project. First, observations in some bull trout populations (and other salmonids) have indicated that weirs and/or the capture process may adversely affect aspects of natural bull trout spawning behavior (e.g., upstream and/or downstream position of spawning).

The potential of interference from a weir may be of particular concern in a system, such as this one, where the actual effect of spring inundation (a result of reservoir fill regimes) of bull trout redds remains a question, and relative location of redds within the accessible reaches may be of potential significance to annual reproductive success. Secondly, bull trout redd counts in these systems over the last decade have been highly variable, as influenced by diverse environmental survey conditions (e.g., peak stream flow events) and differing levels of survey effort, as well as the natural variability of bull trout spawning behavior in these dynamic systems. The data collected in the last four years, however, indicate spawning levels consistent with expectations for a population of this size, providing a sufficient basis for making a decision regarding whether or not the weir would be the best approach to use for developing an index for use in monitoring relative change in population size over time. Several discussions/ conversations were held during 2004 by SPU and USFWS biologists relative to 1) how major question(s) and research focus on bull trout ecology have shifted since writing and initial implementation of the HCP, and 2) how selected funds committed in the HCP for this project might be reallocated to bull trout projects that would better serve and promote understanding of bull trout ecology within the Cedar drainage and/or region in general. Decisions on the status of redirecting commitment funds from this project and/or modification of the project as initially proposed are pending.

Looking Ahead (Planned 2005 Accomplishments)

Staff biologists will continue to conduct surveys under each of these three bull trout monitoring projects during 2005-06 with the intent of extending documentation of the overall range of bull trout in the watershed, increasing knowledge relative to timing of bull trout life history stages and behavior, and adding to current information on bull trout habitat use. The second phase of the redd inundation study will be initiated. In addition, monitoring of the potential re-colonization of upstream reaches of Shotgun Creek will be renewed and results of the final genetic analyses will be completed. Also, as mentioned above, the City will try to reach agreement with the USFWS regarding the best approach to developing an index for monitoring bull trout relative population change over time, as was one intent of the weir proposal described above, and modify the project or reapply funds to other HCP bull trout projects in 2005-08. The City plans to complete scoping and designing the bull trout redd inundation study in 2005 and to implement initial steps during fall/winter 2004/5. The City will also finalize topographical surveys in core spawning reaches of the Cedar and Rex rivers to better evaluate the potential risk of inundation during spring reservoir refill.

Financial Summary

	Year 4 Cost Commitment (2004 dollars	**Year 4 Cost Commitment Expenditures (2004 dollars)**	**Work accomplished**
Bull Trout Spawning Surveys **(N541805)**	$42,175	$28,614	Surveys completed. Cost includes database maintenance/management, and data analysis.
Bull Trout Fry/ Juvenile Surveys **(N541806)**	$42,175	$14,570	Surveys completed, continuing evaluation of fry enumeration methods and techniques. Expanded range of known juvenile habitat. Cost includes data maintenance/management, and data analysis.
Bull Trout Stream Distribution Surveys (N541809) [1]	$14,460	$10,073	Limited field surveys completed in 2004. Cost includes database maintenance/management, and data analysis.
Bull Trout Redd Inundation Study **(N541810)**	$0 (funds from previous years available)	$6,004	Channel topographic survey phase of project initiated and to be completed in 2004-05.
Bull Trout Steam Telemetry Studies **(N541807)**	$0	$0	Project deferred to 2005/2006.
Bull Trout Lake Telemetry Studies **(N541808)**	$0	$0	Project deferred to 2007.
Bull Trout Surveys (adult, weir) **(N541804)**	$60,250	$0	Continued discussion with USFWS and evaluation regarding appropriate methods and timing. Plan to modify and/or transfer funds to other bull trout project activities in 2005-06.

HCP Program Element: Common Loon Monitoring (N541811)
HCP Program Category: Watershed Aquatic Monitoring and Research

Contact: Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Objectives and Goals

Document the reproductive success of common loons nesting within the Cedar River Watershed, especially those utilizing habitat in the Chester Morse Lake/Masonry Pool complex, and provide alternative nest sites through the deployment of artificial nest platforms at appropriate selected location(s) and under appropriate environmental circumstances.

Status of Work (2004)

Although common loons use many lakes in Washington as foraging and resting habitat, often tolerating high levels of human activity, only 10-12 of these lakes are currently known to have supported active nesting in any given year or on a regular basis at any time during the last decade. Nesting habitat and structures are potentially available in willow-dominated zones of the Cedar and Rex River deltas and in specific small areas of Masonry Pool. This nesting habitat, however, is currently subject to springtime water level fluctuations over the course of the nesting season (April through mid-June) of up to 10 feet or more under the present reservoir operating regime.

Relatively little is known about the historic presence or reproductive success of common loons within the Cedar River Watershed prior to the last 20-25 years. Despite the lack of information before that period, a general knowledge does exist of (1) the historic uses of the watershed, (2) the major habitat changes through time, and (3) the degree of protection that has been afforded Chester Morse Lake over the last 100 years. We can reasonably assume that loons have nested on the shores of the Chester Morse Lake reservoir for many decades and probably on the original natural lake (Cedar Lake) for hundreds of years. In the period of the mid-1970s to late-1980s, loons were frequently sighted on Chester Morse Lake, and young chicks were observed by City staff on the Masonry Pool at least once in each of the years 1979, 1982, and 1988.

In order to reduce adverse effects of reservoir fluctuations on nesting loons, since 1990 the City has been conducting an experimental nest platform program in which artificial floating platforms with native vegetation are deployed at the beginning of the loon nesting season, or when reservoir water levels allow, to provide more stable nest sites. Although the platforms are not sufficient to counteract the effects of reservoir fluctuations of more than about 5-8 feet, such as occur during a prolonged, early season drought, this program has demonstrated some success. Platforms have been used by nesting loons in at least one, and typically two, of the three nesting territories on the reservoir complex in each of the 14 project years during the period 1990-2003; a platform has been used in 13 consecutive years in one territory; and a platform has been used in 10 of 14 years in a second territory. Of 31 nests on the reservoir during the period 1990-2003, 23 (74 percent) have been on platforms. Of the 32 chicks produced during this period, 7 chicks hatched on natural nests and 26 chicks (81 percent) hatched on the platform nests.

Monitoring during four common loon nesting seasons (2000, 2001, 2002, 2003) since implementation of the HCP has extended the long-term data record of loon reproduction on the Chester Morse Lake/Masonry Pool complex with somewhat atypical results. In 2000, two of the three pairs in the system nested on experimental platforms, the third pair did not nest. One platform nest produced two chicks. The other platform nest was lost early to a predator or scavenger, but the re-nesting effort of this pair on a natural nest site produced a single chick. Although disappointing, observations during 2001

documented the first year within the last decade in which no loon chicks were produced in the watershed. This result was significant in that, although nesting conditions in the watershed (e.g., lake levels) were apparently normal, none of the three pairs nested successfully. The only nesting attempt was on a platform nest that was lost to a predator or scavenger early in the nesting period as in the previous year; however, no re-nest was established in this case.

Observations of loon nesting activity during 2002 regrettably documented the second year within the last decade, and the second year in succession, in which no loon chicks were produced in the watershed. Although one loon pair attempted to nest on an artificial platform, the level of harassment by bald eagles at the platform site was apparently pervasive enough to cause nest abandonment, and no evidence of re-nesting was observed. Although present within their traditional 'territories' on Chester Morse Lake and the Masonry Pool and initially exhibiting behavior indicative of searching for nest sites, there was no definitive indication that the other two loon pairs established nests. As in 2001, the lack of chick production was significant in that, although nesting conditions in the watershed (e.g., lake levels) were apparently normal, none of the three pairs nested successfully. The lack of common loon reproductive success documented in the Cedar River Municipal Watershed in both 2001 and 2002 was not inconsistent with overall results throughout western Washington, which may suggest a regional, rather than local environmental influence on nesting success during these years. Harassment of nesting loons at and in close proximity to nest sites, however, has been observed more frequently during the last several years on the Chester Morse Lake/Masonry Pool complex, as well as at other nest sites in Washington, and may become more of a threat to the nesting success of common loons in the future than has apparently been the case during the previous decade of research and monitoring.

Artificial nest platforms were deployed in each of the three traditional loon nesting 'territories' in spring 2003 as reservoir levels reached appropriate potential nest sites. Subsequent monitoring of loon behavior patterns, habitat use, and nesting activity during the spring/summer period documented the first successful nest in the last three years within the watershed. This nest was located on an artificial nest platform and produced one chick that survived to fledging. Although present within their traditional 'territories' on Chester Morse Lake and the Masonry Pool, and initially exhibiting behavior indicative of searching for nest sites, there was no definitive indication that the other two loon pairs established nests.

Harassment of nesting loons by both adult and juvenile bald eagles at and in close proximity to nest sites has been observed more frequently during the last several years (i.e., 2000-02) on the Chester Morse Lake/Masonry Pool reservoir complex, as well as at other nest sites in Washington than previously reported. This type of harassment has apparently been pervasive enough to cause nest abandonment in some cases (2000-01 in CRW; 2001 in Tolt). If it has occurred particularly late in the season, no evidence of re-nesting has been observed. Because of the potential for continued increases in the level of harassment of nesting adults and scavenging of loon eggs by bald eagles, experimental modifications were made to several artificial nest platforms in both the South Fork Tolt and Cedar River watersheds in an attempt to reduce the risk, and, if possible, avoid adverse effects of bald eagles on nesting loons.

An open, dome-shaped, arching frame of plastic pipe (one pipe from three of the four platform sides joined in the center) was attached to platforms previously used by nesting loons where harassment had been observed or highly suspected (all unsuccessful nests). Sparse vegetation was then attached to the pipe to create the visual effect of 'cover' above the platform deck (and incubating loon on the nest). The non-rigid, 'flimsy' pipe frame was intended to serve as a deterrence to eagle(s) trying to land directly on the platform, or to perch on the frame itself. The vegetation was not intended to totally hide the bird on the platform, but merely to possibly complement the bird's cryptic coloration. Also, any structure added to the previously successful platform design should not restrict the bird's view from the platform deck.

Experimental modification of the successful platform design had several risks associated with it and several relevant outcomes were highly possible: 1) loons would be 'frightened' by the pipe/vegetation frame and not use the platforms; 2) loons would nest on the platforms, but eagles would not be deterred; or 3) loons would nest on the platforms, eagles would be deterred, and nests would be successful.

Initial results of the platform modification experiment were somewhat promising. A total of three platforms were modified (Tolt–1; Cedar–2) in 2003. Loons nested on two of the three modified platforms and both were successful in hatching chicks (Tolt-2; Cedar-1). The pair in the third territory did not nest in 2003 and had not nested for several years. The only successful nests in either watershed were those that had been modified. One conclusion from this experiment is that the modification did not prevent loons from using artificial platforms and nesting successfully. Also, an initial indication is that the modification may deter eagles from adversely affecting nesting loons on platforms in the short-term, but continued monitoring in successive years will be needed to determine if such modification is a long-term 'fix' to eagle harassment at loon nest platform sites.

Artificial nest platforms were deployed in each of the three traditional loon nesting 'territories' in spring 2004 as reservoir levels reached appropriate potential nest sites. Subsequent monitoring of loon behavior patterns, habitat use, and nesting activity during the spring/summer period documented nest establishments on artificial nest platforms in two of the three traditional territories in the reservoir complex (Rex delta and Masonry Pool). Although the third pair was present in the Cedar delta territory and initially exhibiting some behavior indicative of searching for nest sites, no indication of nest establishment was subsequently observed. Also regrettable, the Rex nest was lost after about 10 days presumably due to a combination of a short-term lowering of reservoir water level, resulting in shallow water at the nest site, and nest predation/scavenging from unknown source(s). A brief attempt at re-nesting by this pair also was unsuccessful.

The pair nesting on a platform in the Masonry Pool occupied the nest throughout a 'normal' incubation period up to the predicted hatching interval, but abruptly left the nest for no obvious reason(s). The presence of egg(s) being present was never confirmed, no observations of actual hatching taking place were recorded, and no post-nest abandonment evidence that hatching had occurred or the nest was scavenged was detected (e.g., egg shell, egg membrane, etc.). No chick was observed with this pair, or other birds, close to the time of nest abandonment within the typically used territory, or for several weeks thereafter. Approximately, eight weeks later, however, a large chick was sighted within the territory indicating that this pair probably re-nested on a 'natural' nest at some unknown location and produced at least one chick as a result of this second nest. Based on the large size (3/4+ of adult length) at first sighting, and a few subsequent observations, it was assumed that this chick had a high probability of fledging.

The importance of the Cedar River Watershed as habitat for common loons takes on added significance when considered in a regional or statewide context, as the three pairs of common loons that typically nest in the municipal watershed have constituted more than one-quarter of the loons nesting in Washington State in many recent years. The production of fledglings from the watershed has, in many years, constituted an even larger fraction of the fledged loons produced in the state, likely as a result of the degree of security within the watershed compared to the high levels of human disturbance to nesting loons on lakes open to the public. As population growth and development pressure from the Seattle/Tacoma metropolitan area continue to diminish the quantity of loon habitat (through housing development around lake and reservoir shorelines) and the quality of habitat (through increasing recreational boat use of lakes and reservoirs, and through sediment input), the availability of undisturbed habitat in the municipal watershed will play an increasingly critical role in maintaining the viability of populations of common loons that nest in the Puget Trough and the western Washington Cascades.

Looking Ahead (Planned 2005 Accomplishments)

Staff will continue to monitor common loon reproductive activity and will deploy experimental nest platforms (as long as monitoring continues to document the efficacy of the program) during 2005 on the Chester Morse Lake/Masonry Pool complex.

A note of caution, however, is warranted for the 2005 nesting season given that snow pack levels in the watershed throughout the month of February have fluctuated between 8-12 percent of normal. If snow pack levels remain in this low range and do not approach normal levels by the end of March, reservoir fill may not achieve level(s) sufficient for loons to even access typical nest site(s) along the lake shore (e.g., 1992). Such relatively low water levels might restrict nest establishment from a behavioral perspective (e.g., unsuitable nest site selection), fail to provide adequate water depth/duration for nest access (i.e., physical limitation), or, even if nests are established, not provide sufficient protection from environmental elements (e.g., wind, waves) or predation/disturbance by other species (e.g., otter, eagles). Because of the steep topography of the majority of the lake shore and the gradual gradient within the delta zones, neither the low water level shoreline, nor artificial nest platform(s) placed in open water that are susceptible to wind and wave action, provide viable nesting options in comparison with sites under more typical reservoir level conditions.

Financial Summary

The HCP commits funding of $30,125 for HCP years 1-10 (in 2004 dollars), with an average of about $3,013 per year (in 2004 dollars). The full cost commitment of $3013 was expended for cost commitments in year 2004.

HCP Program Element: HCP Program Element: Watershed Characterization--Includes Assessment of Expanded Forest Stand Attributes (N541501), Assessment of Expanded Forest Attributes (N541502), Augmentation of Forest Habitat Inventory (N541503), Long-term Forest Habitat Inventory, Old-growth Classification, Field Verification (N541504, N541505), and Forest Habitat Modeling (N541516)
HCP Program Category: Terrestrial Research and Monitoring

Contacts: Amy LaBarge, Senior Forest Ecologist, Dwayne Paige, Senior Planning and Development Specialist, and Duncan Munro, IT-Professional B, Watershed Management Division

Objectives & Goals

The purpose of the watershed characterization project is to provide information to support the following three major uses of that information under the HCP regarding management of the Cedar River Municipal Watershed (CRW): (1) plan and prioritize habitat restoration projects to meet HCP goals and objectives, (2) track changes in habitats over time, and (3) evaluate alternative approaches for different kinds of restoration projects. This project encompasses the specific HCP commitments listed in the title above, as well as the more general commitments to plan and prioritize restoration activities on a landscape scale. Because existing forest inventory data and remote sensing data that were used to develop the HCP are out-of-date and inaccurate, the funding for the above-listed activities has been combined to provide comprehensive, current and useful information to guide planning and monitoring efforts.

Status of Work (2004)

- Established Permanent Sample Plots (PSPs): A total of 60 PSPs were established by consultants in 2004 in second-growth forest habitat throughout the watershed. These PSPs will be used to monitor habitat change over the life of the HCP, as well as to validate remote sensing image data as it is acquired in order to select and prioritize restoration sites.

- Assessed plot-level data underlying expanded forest stand: Conducted a comprehensive review of 1992-1993 forest inventory stand and attribute data and associated remote sensing data layers and released draft Inventory Assessment Report in Spring 2003. Determined that existing expanded forest data is insufficient to meet upland forest restoration project site selection and prioritization needs. Continued to work with statistician to assess plot-level data that underlay that expansion to critique their value in informing a new remote sensing image data and classification system.

Looking Ahead (Planned 2005 Accomplishments)
In 2005, we will continue to work on developing the most cost-effective and useful approach to implementing watershed characterization. We will use existing information and new data that will be acquired in 2005, including field data and remote sensing data. We will integrate inventories of aquatic, riparian, and upland habitats and integrate field sampling information with remote sensing data for greatest usefulness and the most cost-effective use of the funding available. We will continue to pursue collaborative efforts and external grant funding to "leverage" the funding in the HCP.

Primary activities in 2005 will include:

- Finalize assessment of plot level data from 1992-1993 forest inventory to determine whether it can be used to inform new image data and classification.
- Analyze PSP data and project-level monitoring data with statistical consultant to determine power in capturing inherent variability.

- Analyze LiDAR data from King County to evaluate precision, accuracy and reliability of prediction of forest habitat conditions across the watershed. Install additional field plots as determined necessary to validate LiDAR image data.
- Classify old-growth forest habitat conditions based on PSP information collected in 2003 and conduct additional sampling if variability is not captured.
- Evaluate appropriate forest growth models and species/habitat relationship models and work with consultant to customize models to fit watershed restoration needs.
- Re-measure historic PSPs that have 30-50 year history and can inform site-specific forest habitat models and restoration treatments.
- Complete DADD templates.
- Complete development of metadata for map products derived from image analysis.

Financial Summary

	Year 4 Cost Commitment	Year 4 Expenditures	Work accomplished
Assessment of expanded forest stand data [1]	$12,050	$8,798	Statistical analysis of plot-level forest data; PSP installation
Assessment of expanded forest attribute data [1]	$12,050	$9,298	Statistical analysis of plot-level forest data; PSP installation
Augmentation of Forest Habitat Inventory [2]	$18,080	$26,800	PSP installation
Long-term Forest Habitat	$29,370	$39,271	PSP installation
Inventory (Field verification [3] and old-growth classification[4]) **Forest Habitat Modeling [5]**	$11,300	$6,677	PSP installation
TOTAL	$82,850	$90,844	

1 The HCP commitments are to sample and evaluate in HCP years 1-5, and redesign and sample if needed during years 6-10.
2 Complete sampling within HCP years 1-5, if "assessment" finds incomplete information.
3 Design and field verification to be completed within HCP years 1-5, then sample and monitor through HCP year 50.
4 Design and sample in HCP years 3-8.
5 Evaluate and develop in HCP years 1-8.

HCP Program Element: Riparian Restoration Project Monitoring (N541506)
HCP Program Category: Terrestrial Research and Monitoring

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Goals and Objectives

The purpose of this element is to design and conduct a sampling program to monitor riparian forest habitat development and plant species composition changes to track effectiveness and success of riparian restoration projects. This monitoring will include pretreatment baseline information in representative riparian forest sites as well as effectiveness monitoring of selected riparian habitat restoration projects. The application of experimental silvicultural treatments in riparian areas will be monitored in an adaptive management context.

Status of Work (2004)

In 2004, riparian restoration project monitoring occurred on three projects: Webster Creek, Shotgun Creek, and Taylor Creek. Each of these projects had been planted with conifer seedlings in prior years, and survival and growth of seedlings was measured.

Looking Ahead (Planned 2005 Accomplishments)

Riparian restoration project monitoring will occur on Webster Creek, Shotgun Creek, Lost Creek and Taylor Creeks again, as well as on Rock Creek near the 10 Road. Riparian restoration project monitoring will also occur along Seattle Creek and Troublesome Creek, where extensive riparian restoration thinning was implemented in 2004.

Financial Summary

The HCP commits funding of $42,030 for HCP years 3-8 (in 2004 dollars), with an average of about $7,000 per year and increased funding levels in subsequent years. Approximately $1,403 of cost commitment funds was spent on riparian restoration project monitoring in 2004. Watershed Management Division staff performed all of this work.

HCP Program Element: Upland Forest Restoration Project Monitoring (N541507)
HCP Program Category: Terrestrial Research and Monitoring

Contact: Amy LaBarge, Senior Forest Ecologist, Watershed Management Division

Goals and Objectives

The purpose of this element is to design and conduct a sampling program to monitor upland forest habitat development and plant species composition changes to track effectiveness and success of upland forest restoration projects. This monitoring will include pretreatment baseline information in representative forests as well as effectiveness monitoring of selected upland forest habitat restoration projects. The application of experimental silvicultural treatments in upland areas will be monitored in an adaptive management context.

Status of Work (2004)

In 2004, upland forest monitoring occurred on upland restoration thinning project sites, but costs were charged to that program element (C100024). Post-treatment monitoring occurred on the 45 Road Forest Restoration Project, but costs were charged to another element (C100027). Watershed Management Division staff conducted all of this monitoring. Finally, forest consultants installed permanent sample plots (PSPs) and collected forest habitat inventory information in the lower watershed that will serve as a baseline measurement for forest change over time in areas not subjected to restoration treatments.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, pre-treatment effectiveness monitoring will occur at the 700 Road Forest Restoration Project, and costs will be charged to this element. This monitoring will be conducted by staff, including interns.

Financial Summary

The HCP commits funding of $42,030 for HCP years 3-8 (in 2004 dollars), with an average of about $7,000 per year and increased funding levels in subsequent years. In 2004, $8,072 was paid to consultants to install PSPs. As mentioned above, other monitoring that occurred was charged to other program elements.

HCP Program Element: HCP Information Resource Management (includes GIS Data Compatibility) (N541515)
HCP Program Category: Watershed Management

Contact: Tom Van Buren, IT Professional, Watershed Management Division

Goals and Objectives

The intent of this program element is to develop and maintain a well-organized and efficient system of accurate databases, integrated and compatible with the Geographical Information System (GIS), which is essential to support many HCP commitments within the Cedar River Municipal Watershed (CRW). In addition, as indicated in this section, most of the program elements are interdependent and rely on data and analyses from several tasks in order to be fully functional and effective as management tools. Therefore, it is critical that all databases are designed, maintained, and updated by a procedure that will ensure accuracy and integration of information, including the acquisition and incorporation of pertinent information from outside sources.

The objective of this program is to provide a systematic and efficient means by which data collection formats, incorporation of data into databases, database management, and integration with modeling efforts can be designed and maintained to maximize the system's ability to support HCP-related management activities. In addition, databases should be updated with the most current and best available information whenever possible from both departmental and appropriate external sources. Data management systems are being developed for various kinds of users, from technical specialists to the public.

Status of Work (2004)

- Created production instance of a Transportation Information Management System
  Installed map viewing software (ArcReader) on all watershed desktops and published data driven (dynamic) maps
- Derived information products from LiDAR (a remote sensing technology based on laser pulses from fixed-wing aircraft)
- Developed resources to facilitate map production by staff

Looking Ahead (Planned 2005 Accomplishments)

- Complete migration of legacy GIS coverages to Oracle
- Extend hydrology data model to incorporate stream inventory measurements and observations
- Derive additional information products from LiDAR that are required to prioritize restoration activities
- Develop a Watershed Information Portal for Key Watershed Assets:
  - Riparian and Aquatic Information Portlet
  - Upland Forest Information Portlet
- Continue to develop resources to facilitate map production by staff

Financial Summary

The HCP commits specific funding of $59,000 for HCP years 1-8 (in 2003 dollars), with an average of $7,375 per year. $7,375 was expended in Year 3. In addition, the HCP includes a variety of commitments that have no explicit HCP Cost Commitments but that create a need for linking information management to planning and documenting restoration, monitoring, and research activities. The work described above funded by both cost commitment funds and a variety of other budget sources.

HCP Program Element: Species/Habitat Relationship Modeling (contributes to Upland Forest Ecological Thinning, Restoration Thinning, and Restoration Planting,) (N541517)
HCP Program Category: Terrestrial Research and Monitoring

Contact: Bill Richards, Terrestrial Ecologist, and Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Primary Objective (initial project element)

Utilize Habitat/Dispersal Simulation Modeling as a tool to identify and aid prioritization of specific areas within the landscape of the Cedar River Municipal Watershed (CRMW) where forest restoration projects will be most effective in promoting mid- to late-seral forest connectivity as guided by the conservation strategies of the HCP.

Status of Work (2004)

This project is part of the Watershed Characterization project (see separate summary). In order to provide potential habitat benefits for populations of 28 wildlife species dependent on late-seral forest conditions, one of the goals of the HCP is to facilitate the restoration of late-seral forest characteristics by thinning relatively young and dense second-growth forest. The HCP commits to planning forest restoration on a landscape scale, prioritizing projects for the most potential benefit. This modeling application attempts to identify where ecological and restoration thinning projects will most likely contribute to the connectivity of mid- to late-seral forest habitat.

This project element is being conducted in two phases: 1) habitat modeling, and 2) dispersal simulations. The habitat-modeling phase combines the best available landscape data to define current forest habitat conditions using forest growth models (e.g., FVS, FPS) to predict forest conditions at the end of the 50-year HCP. Ecological and restoration thinning will be simulated in potential stands under current habitat conditions and 'grown' 50 years to produce alternative landscape conditions. The dispersal simulation phase utilizes a spatially explicit model (PATCH) designed to simulate populations of territorial, terrestrial vertebrate species. Comparing dispersal success and dispersal patterns for a range of late-seral dependent wildlife species between alternative landscape conditions will identify forest areas that, when thinned, will contribute most to future forested habitat connectivity. During 2001, we conducted preliminary evaluations of some available models, and preliminary evaluations of data needed for these models.

In 2002, we completed both phases of the modeling process as described above. Completion of this project element has provided the first planning 'tool' that we have developed under the HCP to address landscape-scale prioritization of forest sites in which to plan and implement restoration and ecological thinning to facilitate development of late-seral habitat conditions (e.g., connectivity).

In 2003 and continuing throughout 2004, we investigated the potential effects of planned ecological thinning projects on wildlife habitat structure at selected low and mid-elevation project sites. We also evaluated several types of remotely sensed data (e.g., MASTER data, LIDAR) as a potential source of stand composition and structural data that would support and improve future wildlife and species distributional data within the watershed. Field data was also collected in lower elevation, second-growth stands to be used in modeling exercises and for restoration planning purposes. Further modeling efforts will be conducted when these types of remote sensing data coverages become available and are processed for use with any appropriate and available modeling applications.

Looking Ahead (Planned 2005 Accomplishments)

Staff will continue to investigate the availability and effectiveness of current technology pertinent to development and/or utilization of species/habitat modeling capability to support landscape level decisions for habitat protection and management under the Conservation and Mitigation Strategies in the HCP during 2005. Cooperation and/or collaboration with state and federal agencies will be investigated as one element of this assessment. As our capability to more accurately classify habitat within the watershed improves concurrently with advances in remote sensing technology (e.g., MASTER data, LIDAR), this analysis can be regenerated to refine results, provide a basis for comparison of alternatives, and improve predictive accuracy. Use of more advanced forest growth models that may have become available will also be investigated as a means of improving the accuracy of habitat condition simulations.

Financial Summary

The HCP commits funding of $120,500 for HCP years 1-5 (in 2004 dollars), with an average of $24,100 per year (in 2004 dollars). A total of $14,840 was expended in 2004, for staff time on modeling and remote sensing data to be used for forest characterization, as well as forest habitat sampling by consultants. (Also described in the summary on Watershed Characterization.)

HCP Program Element: Species/Habitat Relationship Modeling (contributes to Upland Forest Ecological Thinning, Restoration Thinning, and Restoration Planting,) (N541517)
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Looking Ahead (Planned 2005 Accomplishments)

Staff will continue to investigate the availability and effectiveness of current technology pertinent to development and/or utilization of species/habitat modeling capability to support landscape level decisions for habitat protection and management under the Conservation and Mitigation Strategies in the HCP during 2005. Cooperation and/or collaboration with state and federal agencies will be investigated as one element of this assessment. As our capability to more accurately classify habitat within the watershed improves concurrently with advances in remote sensing technology (e.g., MASTER data, LIDAR), this analysis can be regenerated to refine results, provide a basis for comparison of alternatives, and improve predictive accuracy. Use of more advanced forest growth models that may have become available will also be investigated as a means of improving the accuracy of habitat condition simulations.

Financial Summary

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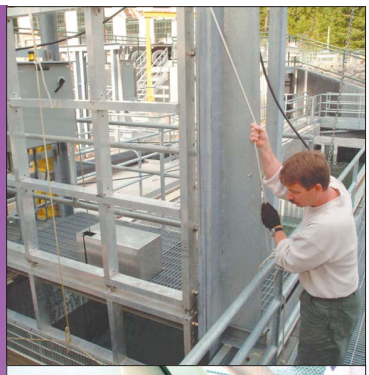


Landsburg Mitigation Summaries

City of Seattle

Seattle Public Utilities & Seattle City Light

Landsburg Mitigation Background

The anadromous fish conservation strategies are designed to mitigate for the blockage to fish passage created by the Landsburg Diversion Dam. These strategies are designed to complement other regional efforts to protect and restore declining stocks in the Lake Washington Basin. The intent is to implement biologically sound solutions that (1) contribute to the recovery and persistence of healthy, harvestable runs of anadromous fish in the Cedar River and Lake Washington Basin; (2) have a high likelihood of success; and (3) maintain a safe, high quality drinking water supply.

Anadromous salmonids have not entered the protected watershed in nearly a century. The HCP provides passage for all native anadromous salmonids into the protected watershed, significant regionally as refuge habitat in that it is highly protected and in relatively good condition. Included among these native salmonids are chinook and coho salmon, and steelhead trout. The sockeye salmon stock in the Cedar River was introduced from the North Cascades. Because of risks to public health, the City cannot allow passage above the raw water intake of the mass-spawning sockeye salmon. In lieu of passage, the City commits to artificial propagation for sockeye, with extensive monitoring and appropriate adaptive management provisions to reduce or eliminate risks to wild fish. In addition, the City commits to funding habitat protection and/or restoration for anadromous fish in the Cedar River Basin downstream of Landsburg.

Specifically, the City has committed to the following activities:

- Provide funding to protect and restore habitats and populations of anadromous fish currently blocked from entry into the municipal watershed by the Landsburg Diversion Dam
- Construct fish ladders, protective screens on the water intake, and other improvements for the safe passage of chinook, coho, steelhead, and other native fish species over the Landsburg Diversion Dam, providing access to some of the most protected “refuge” habitat in the region
- Prior to construction of fish passage facilities, commit to interim mitigation for chinook, coho and steelhead, which could involve conducting key studies or emergency supplementation, if justified.
- Construct a new sockeye hatchery capable of producing up to 34 million fry, replacing the existing interim hatchery facility at Landsburg
- Continue to operate the interim sockeye hatchery at Landsburg as mitigation until the replacement hatchery is built
- Provide funding for habitat protection and restoration downstream of the Landsburg Diversion Dam for all anadromous fish species
- Develop and implement a comprehensive program of research, monitoring, and adaptive management for salmon and steelhead
- Create the Cedar River Anadromous Fish Committee, comprised of agencies signatory to the Landsburg Mitigation Agreement and other stakeholders, which will advise the City regarding implementation of anadromous fish mitigation

The following pages provide summaries of the individual HCP PROGRAM ELEMENTS under the Landsburg Mitigation program category.

HCP Program Element: Interim mitigation for Coho, Chinook and Steelhead (N663201)
HCP Program Category: Chinook, Coho, Steelhead Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

This program has two main objectives, gathering biological information that is critical in designing and managing effective, biologically sound short-term and long-term conservation measures for restoring Chinook, coho and steelhead runs to the Cedar River, and if appropriate, designing and implementing supplementation programs to help preserve one or more of the populations.

Status of Work (2004)

Based on recommendations from the AFC and approval by the Parties to the LMA, the following activities were included in the Interim Mitigation Program in 2004.

Evaluation of recolonization by coho and Chinook salmon above Landsburg Dam

This was the second year of a comprehensive set of monitoring studies designed to track the recolonization of habitat above Landsburg by coho and chinook salmon. This program is a collaboration of effort and resources from Seattle Public Utilities (SPU), Northwest Fisheries Science Center (NOAA), Sea Grant and the School of Fisheries and Aquatic Sciences at the University of Washington. The goal of the project is to provide a comprehensive evaluation of recolonization by anadromous species, including habitat relationships and interactions with resident species. Initial results of these investigations have been presented to the AFC, at a seminar at the U. of Washington and at other meetings as well.

Collection of samples and data at Landsburg (allocation: $5,000)
To meet the stated project goals a number of projects have been implemented. To quantify and characterize salmonids that are recolonizing the Cedar River above Landsburg and to determine contribution of initial colonizers to the successive generation, tissue samples and biological data were collected from Chinook and coho at the Landsburg Fish Ladder. Project funding was used to collect data from September through February, including number, species, timing, length, sex, and presence or absence of the adipose fin. Tissue samples were collected for genetic analyses to allow parent/progeny relationships to be identified. This will allow us to distinguish between additional strays and the progeny that are produced by the original spawners and track adult to adult returns for fish spawning above Landsburg Dam. This information will be useful in tracking the rate of recolonization and aid evaluation of the effectiveness of the passive colonization strategy. Genetic samples are also being used to assist the genetic evaluation of chinook in the Lake Washington Basin that is currently underway as part of the WRIA 8 recovery planning effort.

Distribution of spawning activity above Landsburg Dam (allocation: $7,070)
Radio telemetry equipment and stream surveys were used to collect information on the movement and spawning distribution of coho upstream of the dam. Project funding was used to purchase an additional receiver to station at the Landsburg Dam this year to provide data on fish moving downstream of the dam. Separate funding was used to conduct periodic redd surveys for Chinook. Spawning information has now been collected for two years.

Distribution, habitat use and density of anadromous juveniles and resident species (allocation: $17,804)
To evaluate the use of habitat and interactions of colonizing juvenile fish with resident species, surveys were conducted for juvenile coho from August through September, focussing on the reaches of the river closest to Landsburg Dam. Researchers also installed PIT tags in juvenile coho and trout to estimate over winter survival and to determine specific growth rates and movement patterns. Small numbers of chinook were also found to be rearing in the area during late summer.

Nutrient levels (allocation: $7,512)
To evaluate impacts of marine-derived nutrients on the watershed ecosystem and potential effects to drinking water quality researchers sampled for marine-derived nutrients in late summer 2004 to compare with samples collected during the baseline period. Water samples were collected from July through January 2005 to span the spawning runs.

Adult trap improvements (allocation: $7,000)
Funding under this project was allocated for trap improvements at Landsburg that could better retain adult salmon and steelhead once they enter the sorting area. These improvements were made with Fish Passage CIP funding.

Juvenile trap (allocation: $10,000)
Funding for the juvenile trap was not used. Early engineering discussions about potential designs uncovered potential conflicts with federal screening guidelines that would need to be resolved before moving ahead with the juvenile trap. It is not clear at this time whether further work on this project will occur.

Rainbow trout and steelhead genetics (allocation: $4,352)
The first year of research on genetic relationships among resident and anadromous *Oncorhynchus mykiss* was completed. Analysis of the samples collected through 2003 and a progress report was completed (Marshall et al 2004). Additional samples were collected in 2004, but the analysis and completion of the final report was postponed to 2005. Initial results published in the progress report included evidence that hybridization or introgression between cutthroat and *O. mykiss* is occurring and the study points out the importance of understanding this phenomenon. The progress report states that "conservation of the Cedar River resident *O. mykiss* populations is an important component for restoring the native steelhead resource. Both upper and lower basin populations appear to share the genetic legacy of local steelhead…". The final report for the entire study is expected in November 2005.

Adult PIT tag detection at the Ballard Locks (allocation: $50,000)
In 2003, the US Army Corps of Engineers (USACOE) and WDFW funded an evaluation of noise levels at specific weirs within the fish ladder at the Hiram Chittenden Locks to establish the feasibility of using adult PIT Tag readers in the ladder at the Locks. The results supported proceeding with the installation of this equipment and, in 2004, funding from this program was used to assist with the purchase and installation of tag detection equipment. The installation was completed in June, 2004, in time for the salmon return.

The primary objective of this work is to gather information from PIT-tagged adult salmon returning to Lake Washington that were tagged as juveniles in 2000 through 2004 in the Cedar River and elsewhere in the Lake Washington basin. This information will be used to evaluate questions associated with juvenile outmigration to gain a better understanding of what proportion of juveniles use the smolt flumes, which can be used to inform estimates of survival. Detection rates decline over time and it is unclear whether this is due to changes in exit pathways at the locks, in lake mortality rates or rates of residualization. USACOE provided resources to install and operate the equipment. Data from returning adult salmon in 2004 has been processed and summarized in a technical memorandum (DeVries 2004). This report provides information, by species, on the proportion of smolts detected in the smolt flumes.

Roughly 50% of the sockeye, 25% of the later migrating chinook smolts from the Cedar River and 67% of the coho adults were also detected as juveniles passing through the smolt flumes. Additional information is provided on the proportion of adults that pass the ladder multiple times. The proportions in 2004 were sockeye (18%), chinook (7%) and coho (27%). Sample sizes used in these estimates are small and the analyses will be strengthened by additional data in years to come.

Looking Ahead (Planned 2005 Accomplishments)

Recolonization evaluation above Landsburg Dam
BPA mitigation funds are being used to support the 2005 recolonization studies. An expansion of this effort is expected in 2005 and is being jointly managed by the Water Quality and Supply Division and Watershed Management Division of SPU.

Rainbow trout and steelhead genetics
The AFC has recommended funding for additional genetic samples by WDFW to complete the analysis for this project. If approved by the LMA Parties, WDFW will be collecting the following samples in 2005: 25 *O. mykiss* in Chester Morse Lake, 50 *O. clarki* smolts from floating trap operated by WDFW in the lower Cedar River. WDFW will likely complete the analysis of all data and issue a final report describing the results of their evaluation in November 2005.

Predation study
The AFC has recommended funding a two-year project to quantify predation on juvenile steelhead, Chinook, and coho salmon by cutthroat trout, northern pikeminnow and other predators in nearshore regions of Lake Washington during winter-spring and in offshore regions during spring-summer. The parties have approved this recommendation and the work will begin during spring 2005. Collaboration is likely between this investigation and the electrofishing survey in L. Washington during the last week of June.

Adult PIT tag detection at the Ballard Locks
The PIT tag readers in the fish ladder at the Hiram Chittenden Locks will continue to monitor for returning tagged adult salmon in 2005. The Corps of Engineers will oversee continued operation of the detection equipment.

Projects under consideration
The AFC has recommended that the remaining funds in the program be held until the following projects are developed/investigated further:

1. A pilot project in 2005 that would be determine the feasibility of tagging sufficient numbers of cutthroat trout in Lake Washington for an predator abundance study in 2006.
2. A trapping operation to capture steelhead from the Landsburg fish ladder for additional genetic analysis
3. A peer review of the WDFW *O.mykiss* study.

Financial Summary

The financial summary may be updated. The HCP provides $840,600 (2003 dollars) for this program for HCP years 1-8. Due to a carry over of unspent funding from 2001 and 2002, the available funds for each year from 2005-2008 have been increased to roughly $150,000 per year. Beginning in 2005, this project is now a CIP project, providing more flexibility with year to year budgeting. The 2004 commitment for this program was $108,450. The total commitment amount expended on this program was $92,071 and SPU spent an additional $9,288 implementing this program. Breakdown of commitment expenditures follows:

Adult PIT tag readers - $50,030
Telemetry receiver - $7,660
Juvenile surveys and nutrient sampling - $24,861
O. mykiss genetics - $4,102
Landsburg sampling - $5,394

HCP Program Element: Landsburg Fish Ladder and Sorting Facility Operations (intake screen, fish ladders and downstream passage gate)
HCP Program Category: Chinook, Coho, Steelhead Mitigation

Contact: Rand Little, Senior Fisheries Biologist, Water Management Section

Objectives and Goals

Allow access for all native fish species in the Cedar River, except sockeye salmon, into the municipal watershed.
Operate the downstream passage gate and intake screening facilities to safely pass downstream migrating fish while meeting HCP instream flow management requirements and providing high quality municipal water

Status of Work (Brood Year 2004)

All elements of the project, intake screens, downstream passage gate, the fish ladder and associated fish sorting and transport facilities, were placed into operation in late summer of 2003, just prior to the return of adult salmon. 2004 marks the first full year of operations for the newly constructed facilities.

Again this year, SPU staff used sorting and trapping facilities, not only to prevent sockeye salmon from migrating upstream, but also to observe and sample all upstream migrating adult Chinook and coho salmon. Technicians recorded the gender and length of all Chinook and coho and collected genetic tissue samples from each fish. All fish were also checked for the presence or absence of an adipose fin. With full marking of all hatchery salmon released in the basin, those with missing adipose fins can be identified as fish of hatchery origin. By trapping all upstream migrating Chinook, operators are able to assess the relative abundance of naturally produced and hatchery produced adult Chinook and coho migrating over Landsburg.

Information collected from captured fish also helped support re-colonization studies being conducted in collaboration with NOAA Fisheries and the University of Washington, School of Fisheries and Aquatic Sciences. Through the use of genetic family typing, researchers hope to determine the degree to which the fish spawning upstream of Landsburg are successful in producing future generations of returning fish. In addition, a substantial number of the migrating adult coho salmon were radio tagged and tracked as they passed into the habitat upstream of the dam. Sorting facilities, originally designed to be used only through the end of the adult sockeye migration period, were operated through end of adult coho migration in support of the re-colonization studies.

In 2004, the Fish Ladder and Sorting Facilities were placed into passive mode on January 25. In the passive mode, all upstream migrating fish are allowed to pass through the fish ladder unhindered. Electronic fish counting facilities provide the ability to monitor the number, species and approximate size of all upstream migrating fish. Although the electronic counting equipment was inoperable for more than a month during the spring of 2004, a total of XXX adult rainbow and cutthroat trout were recorded passing upstream on what appears to be a spring spawning migration.

The Fish Ladder and Sorting Facilities were returned to sorting mode operation during the week of September 6, 2004. The first adult Chinook passed through the facilities and into the habitat upstream of the Landsburg Dam on September 17. A total of 51 adult Chinook and 99 adult coho salmon passed upstream during the 2004 brood year (see Table 1). Genetic samples were collected from all fish passed upstream. As in the previous year, the majority of Chinook that passed upstream exhibited clipped adipose fin clips indicating that they were of hatchery origin. Of the 51 Chinook passed upstream, 22

were female. Subsequent redd surveys in the mainstem upstream of Landsburg documented a total of 19 Chinook redds. Only 2 of the coho passed upstream had adipose fin clips indicating that most coho were likely of natural origin. A total of 47 coho were radio tagged and tracked as part of a collaborative project with the University of Washington. After several tagged female fish experienced apparent pre-spawning mortality, radio tag applications were restricted to male fish only. Most coho appeared to spawn in the mainstem upstream of Landsburg. In addition to coho and Chinook, XXX sockeye salmon entered the facility, were sorted and either transferred to the Interim Landsburg Sockeye Hatchery where they were used for broodstock, or transported back downstream and released into the river.

On February 14, 2005, 14 days after the last adult coho was passed upstream, the fish passage facilities were switched to passive migration mode eliminating the need to sort. A number of improvements were made to the electronic fish counting device in 2005 and it appears to be working well. Similar the pervious year, we observed a substantial number of adult rainbow and cutthroat trout passing upstream in what appeared to be a spawning migration during the late winter and spring.

Looking Ahead (Planned Brood Year 2005 Accomplishments)

- The fish ladder will continue to be operated in passive migration mode through the late summer. We will continue to monitor all upstream migrating fish using the electronic fish counting device in the upper fish ladder.
- Fish sorting operations are scheduled to recommence in early September as significant numbers of returning adult salmon begin to arrive in the Landsburg area.
- SPU will continue to work with State and Tribal fisheries resource co-managers and NOAA Fisheries, the parties to the HCP and the Anadroumous Fish Committee regarding the issue of passing upstream migrating hatchery salmon into the habitat above of the Landsburg Dam.
- SPU will continue to work with NOAA Fisheries and the University of Washington to support ongoing salmon re-colonization studies.

Financial Summary

Operational commitment costs for HCP Year 4 were $60,250. Actual commitment expenditures for HCP Year 4 totaled XXXXX.

Table 1: Landsburg Fish Passage Facility Salmon Count Summary*; Brood Years 2003 and 2004*

Brood Year 2003

Chinook salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**6**	**10**	16
Male	**18**	**45**	63
Total	**24**	**55**	79

Coho salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**18**	**3**	21
Male	**25**	**1**	26
Total	**43**	**4**	47

Brood Year 2004

Chinook salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**7**	**15**	22
Male	**10**	**19**	29
Total	**17**	**34**	51

Coho salmon counts

	Adipose fin present	Adipose fin absent	Total
Female	**32**	**2**	34
Male	**65**	**0**	65
Total	**97**	**2**	99

*Two female coho were subtracted from previous totals because they died within the ladder after being radio tagged. Two additional radio tagged female died before spawning but 10 - 14 days after being tagged; these fish are included in the totals above.

HCP Program Element: Interim Mitigation for Sockeye Salmon (N663202)
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The Washington Department of Fish and Wildlife (WDFW) operates a sockeye broodstock collection facility and hatchery on the Cedar River under Cooperative Agreement with Seattle Public Utilities (SPU). The interim hatchery program first began operations in 1991 to halt the decline in abundance and to provide the opportunity to evaluate the causes of declining runs.

The hatchery culture strategy is to incubate and release fry soon after they leave the incubators. The overall goals are to manage Cedar River sockeye as an integrated population and to maintain the productivity of naturally spawning sockeye over successive generations. The other major goal of the program is to minimize or avoid adverse impacts to chinook and other natural spawning populations in the Lake Washington Basin.

Description

The hatchery process begins each year with the collection of broodstock, primarily from the temporary weir/trap at RM 6.5. Egg take goals are established annually based on expected run size and confirmed by the AFC. Weekly targets for gamete collection are based upon the average run timing curve for the Cedar River. Broodstock fish are transported and held to maturity in a small holding facility located near Landsburg Dam. Some broodstock are also collected at the Landsburg fish passage facilities, externally marked and transported for holding at the adult facility to supplement those collected at the weir. The egg take and fertilization process for sockeye involves special disinfection procedures to avoid transferring IHN virus from parents to offspring. Protection of the water supply from IHN contamination is an essential consideration as well. Eggs are held in incubators until the majority of fry are ready to emerge. Emergence is currently non-volitional (the entire incubator is unloaded at one time) and this results in the release of some of the fish in each group at a time that is either too early or too late in their development. Fry are released at night from multiple release sites in the river. Most reach the lake to begin rearing by the following morning. Most sockeye remain in the lake until the following May (12+ months) before migrating to saltwater as smolts. Sockeye return to spawn as 4 and 5 year olds.

All fry released by the hatchery are marked during the incubation process to enable them to be identified as being of hatchery origin and different mark codes are used to allow identification and comparisons of different groups. Marking has been used to distinguish groups of different release times and river release sites as well as for evaluating the effect of short-term rearing.

All groups of released fry are sampled for IHN virus prior to release and these samples are processed in the WDFW pathology laboratory

An important goal of hatchery operations is to try to avoid having adverse impact on naturally reproducing populations, particularly chinook. Operating protocols for the broodstock collection facility were developed to minimize delay and redistribution of spawning activity of chinook while allowing collection of sockeye to meet the production goal of the hatchery. Each year, survey results from the previous year are reviewed by the AFC to provide a basis for deciding if these protocols need to be changed.

The HCP includes a substantial monitoring program to evaluate other concerns about potential impacts, such as straying and food supply. These are described elsewhere in this report.

Project Status

Brood Year (BY) 2003

In October 2004, WDFW provided the AFC and SPU with a draft summary report for interim hatchery operations for BY 2003 (September 2003 through April 2004). In 2003, the 3,261 females were spawned to produce 11.1 million eggs and the average fecundity per female was 3,412 eggs per female. This was 64.7% of the egg take goal. The primary reason why the egg take goal was not met was that high flows during the third week of October made it impossible to continue collecting significant numbers of broodstock. Egg incubation started on September 18, 2003 and ended on April 3, 2004 with the last fry release. Overall survival from egg to fry was 88%; this was lower than average and likely due to the effects of the high flows on continued collection of males. Males had to be spawned multiple times and fertility was adversely affected. No infectious hematopoietic necrosis virus (IHNV) was detected during incubation and adults showed unusually low levels of the IHNV during the early and middle eggtakes. However, the risk of additional IHNV will continue to be elevated until water supply improvements are completed and the replacement hatchery is built.

In the winter and spring of 2004, the interim hatchery released 9.9 million fry in the Cedar River. Of the total released, 7.2 million fry were released at river mile 0.1 and 2.7 million fry were released directly from the Landsburg Hatchery at river mile 22. This release strategy, which concentrated more releases in the lower river was approved by the AFC was intended to prevent large numbers of hatchery released fry from being captured at the fry trap in the lower Cedar River. Results from previous years indicate that adults returning from lower river fry releases will distribute throughout the river to spawn, which is the desired goal associated with an integrated stock.

Brood Year 2004

In May 2004, the comanagers reported the return estimate for Lake Washington sockeye was 485,000 (fry based forecast). WDFW determined that the return would support an egg take goal of 17.2 million for the hatchery and the AFC recommended that as the hatchery's egg take goal for BY 2004. Operations began with WDFW installing the broodstock collection weir in September at RM 6.5 during the week following Labor Day. High flows in the middle of September (9-11-04 through 9-26-04) threatened the weir and made it difficult to collect broodstock. The hatchery staff worked hard to ensure that the weir was not damaged and the return of more normal flow conditions allowed the collection of 5,092 females and 4,458 males (of which 154 males were live spawned) by the time that the weir was removed on November 18, 2004. In the fall of 2004, the Landsburg fish passage operation provided the hatchery with sockeye broodstock totaling 171 female and 354 male sockeye (provisional data). This operation was recommended by the AFC due to the high early flows and results from the previous year indicated that the majority of sockeye collected at Landsburg were of natural origin. The total egg take for this year was 16.7 million eggs. Of these 15.3 million eyed eggs were seeded into incubators to complete the incubation process.

Evaluation Results (also see reports of sockeye monitoring projects)

In May 2004 (11th, 18th, and 25th) WDFW collected otoliths from 1,070 sockeye smolts (mostly BY2002) in a seining operation in Lake Union. Otolith information was analyzed allowing comparisons by treatment group (time of release, fry release location, fed and unfed) and origin for size and survival. Funding for analyzing the otoliths was received from the Puget Sound Recreational Fisheries Enhancement (PSRFE) fund. The otolith data were used to provide information for determining effects of release site on survival and growth (see Schroder memo to AFC 2005 for complete results). Some examples of the results include: 1) short term feeding improved fry to smolt survival for hatchery releases compared to unfed hatchery releases; 2) release location of hatchery fry did not significantly affect fry to smolt survival; 3) survival improved for hatchery fry released in the last third of the release period compared to the first two thirds; 4) natural origin fry survived better than unfed hatchery fry; and 5)

short term feeding raises survival rates of hatchery fry released downriver to levels comparable to wild fry. (Note that natural origin fry are treated as a single group since there is no way to identify the time that they entered Lake Washington.) These results should be viewed with caution because they are based on a single year of data. This information, particularly if collected for a number of years, provides direct feedback on the relative survival rates of time and release strategies. This information is also useful in evaluation of hypotheses concerning the effects of constraints associated with the interim hatchery (e.g. non-volitional emergence, release of fry soon after they are forced from the incubator and accelerated development causing early entry into the lake) and provide an indication of whether the design and operating protocols of the replacement hatchery will address these constraints. For example, plans to closely match incubation temperature in the hatchery with the natural temperature regime in the river is expected to shift hatchery emergence timing to correspond to natural emergence timing. This is expected to improve hatchery fry survival. The data from this first year of smolt evaluation offers support for this expectation.

The 2003 annual evaluation of the effectiveness of operating protocols for the broodstock collection facility on reducing impacts on chinook migration and spawning distribution was done by WDFW and presented to the AFC (WDFW report 2004). Information from chinook redd surveys was used in this evaluation (Burton et al 2004) along with data collected during weir operations. Out of 337 chinook redds, 318 (94%) were created above the weir. Of the 19 redds below the weir, 2 were within 25 m of the weir. These two redds were formed during a period when the weir was closed for passage opportunities for all but 15 minutes of a four day period. This prompted AFC discussion that led to agreement that operations would be improved by having the staff look further downstream of the weir to detect chinook that might be holding during lower flows. Detection of chinook triggers removal of weir panels, providing greater opportunity for passage. This year, an estimated 94% passed the weir without any handling, compared to an average of 89% for the previous four years. The report concludes that “proper rack operation has minimal detectable impact to migration patterns and spawning success of chinook”. The AFC continues to adaptively manage this aspect of the hatchery.

Harvest

The comanagers determined that a harvestable surplus of sockeye was available in 2004 and established harvest goals of 26,500 sockeye for a sport fishery and the same for the tribal fishery.

Fishery openings for sport anglers occurred on July 17th, 24th, and the 29th.

Capital Improvements

In 2004, SPU applied for permits to make improvements to the hatchery water supply. Once completed these improvements should lessen this risk of further IHN outbreaks in the interim hatchery.

Looking Ahead (Planned 2005 Accomplishments)

Due to delays resulting from the development of a SEIS for the new hatchery, SPU and WDFW signed an extension to the MOA that extends the operation of the interim hatchery to December 31, 2007. Further work to secure permits to improve the security of the water supply will occur in 2005. The HCP calls for initiation of fish health monitoring and fry condition monitoring in 2005.

Financial Summary

The HCP commitment for this program in 2004 was $308,480. The total commitment amount expended on this program was $311,385 and SPU spent an additional $8,514 supporting this project.

HCP Program Element: New Sockeye Hatchery - Design and Construction (C100032)
HCP Program Category: Sockeye Mitigation

Contact: Bruce Bachen, Senior Fish Biologist, Water Management Section; Charlie Madden, Project Manager, Engineering Division; Judith Noble, SEIS manager

Objectives and Goals

The primary goal of this program is to develop an effective, comprehensive, and biologically sound artificial sockeye propagation program consistent with the Cedar River Habitat Conservation Plan. The objectives are to plan, design, permit and construct a sockeye facility to replace the interim sockeye facility that is capable of producing 34 million sockeye fry per year as well as develop the hatchery program documents (biological criteria, operating protocols, adaptive management plan (AMP), and capacity analysis). Annual hatchery production goals are expected to depend on natural production levels and may be less than the capacity of the hatchery. Adaptive management will be used to evaluate key uncertainties concerning potential adverse effects on naturally reproducing populations in the Cedar River and Lake Washington Basin and to apply this information to management of the project to reduce or avoid these effects, if they occur.

Status of Work (2004)

Environmental Review
The Cedar River Sockeye Hatchery Final Environmental Impact Statement (FEIS) and Response to Comments document were released in March 2003. In April, a citizen filed an appeal regarding the adequacy of the FEIS with the City of Seattle's Hearing Examiner. Activities associated with this appeal required extensive staff time from SPU and the City's Law Department. An addendum to the FEIS was released in August 2003, containing additional information on the project that became available after the FEIS had been released. The 4-day appeal hearing was held in early October. After the hearing, the City and the appellant filed lengthy written briefs summarizing their respective positions for the hearing examiner and the examiner's decision was issued in November. She required Seattle Public Utilities to issue a Supplemental EIS, providing additional information including worst case analyses of some potential effects of the hatchery and providing further detail regarding the adaptive management plan. Work began on the Supplemental EIS in late 2003.

Work continued on the Supplemental EIS throughout 2004. Development of worst case analyses utilized panels of experts to identify appropriate response variables, estimate potential changes in response variables and assign probability of the responses under worst case assumptions. The summaries of these findings provided the basis for the worst case discussion in the SEIS. Further development of the Adaptive Management Plan occurred in 2004 and the Supplemental EIS describes the AMP and how it would be used as mitigation for the project.

Project Design
Engineering design of the hatchery facilities was 90% complete by the end of 2004. Staff from WDFW, the Muckleshoot Indian Tribe and SPU reviewed these plans. The design work needed for water supply improvements is nearly complete and these plans will be used for making improvements to the water supply of the existing hatchery due to the pressing need for greater security from contamination by IHN virus. Design of the broodstock collection facility continued, with the focus on addressing concerns that have been raised by Renton staff and elected officials over use of the I-405 site. The design is evolving to address these concerns and modifications are being based on a design developed by the Alaska Department of Fish and Game that has also been tested in a multi-agency demonstration project on the Stanislaus River in California by SP Cramer and Associates. Further information on design improvements

was provided to Renton elected officials, who indicated that the modifications had reduced their concerns. The elected officials encouraged the Renton staff to continue to work with SPU and WDFW regarding use of the proposed site at I-405.

Project Schedule
Due to the delay in completing the environmental review process, the project timeline has been adjusted to reflect a two-year delay. The hatchery is now scheduled to be completed by August, 2007.

Looking Ahead (Planned 2005 Accomplishments)

The Draft SEIS was released for public review on February 16, 2005. Completion of the SEPA process and completion of final design for the hatchery facility is planned for 2005.
Final approval by the Parties of the Landsburg Mitigation Agreement of the adaptive management plan, capacity analysis, the operating protocols and the design is anticipated in 2005. If so, preparation for full implementation of the adaptive management plan would begin in 2005 as well.

Financial Summary

Total project expenditures amounted to $457,265 in 2004, of which $276,087 was spent on design, program development and environmental review services. Total program development and construction costs are currently expected to exceed the HCP commitment level by approximately at least $2 million. In 2004, $297,753 was expended toward the HCP cost commitment.

HCP Program Element: Drinking Water Quality Monitoring, Fish Passage Evaluation (N663504)
HCP Program Category: Passage of Chinook, Coho & Steelhead Above Landsburg Research & Monitoring

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

Drinking water quality monitoring was established to better understand the environmental and drinking water quality effects of fish passage at Landsburg. There are three main components: (1) collect nutrient data from water samples, fish and riparian biota to establish baseline conditions before passage; (2) periodically sample to determine if and how these nutrient conditions change in response to the presence of salmon carcasses, and, (3) conduct simulation experiments with small artificial channels to evaluate impact of fish carcasses on stream water quality.

This project does not involve the monitoring of drinking water quality, despite what the title implies. However, it will provide data useful in evaluating the possible role of fish passage in any subsequent drinking water quality problems related to the Cedar source. For example, correlation between the problem and nutrient level changes above Landsburg could be evaluated.

The project is a joint effort of SPU and the National Marine Fisheries Service under a memorandum of agreement.

Status of Work (2004)

The baseline nutrient data was collected in 2000 – 2002. Artificial channel experiments were delayed due to difficulty in identifying a suitable water source. Researchers concluded that the best source and site would be at Landsburg Dam. Development of the source was incorporated into fish passage construction at Landsburg. In 2003, a water supply pipe and 6 inch valve was installed at the new intake screen at Landsburg to provide a gravity fed source of screened water for the channel experiments.

No new work was undertaken in 2004. The next sampling period is currently scheduled in 2008, as specified in the HCP.

Separate recolonization studies conducted in 2004 did include additional nutrient sampling (see Interim Mitigation Program for Coho, Chinook and Steelhead report)

Looking Ahead (Planned 2005 Accomplishments)

Recolonization studies above Landsburg Dam include additional nutrient work, with the focus on localized effects on salmon or resident species. The artificial channel experiments were delayed by the need for water supply development. There are unresolved budget and technical questions that need to be addressed before this aspect of the project can proceed.

Financial Summary

There were no HCP reported commitment expenditures totaled in 2004, leaving the remaining unspent commitment of $12,567.

HCP Program Element: Fry Marking and Evaluation (N663402)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

Since the beginning of the Cedar River sockeye salmon hatchery program, the otoliths of all hatchery-produced sockeye salmon fry have been thermally marked. Marks have been induced on the otoliths of incubating sockeye through alternating exposure to chilled and ambient temperature water. Marked otoliths are unambiguous and are easily distinguishable from those in naturally spawning sockeye. The objective of the program has been to provide a source of marked fish that can be used to evaluate the hatchery program and to address fundamental questions about the performance of Cedar River hatchery produced sockeye salmon. This type of information is needed to help manage the ongoing sockeye salmon hatchery program as well as to provide information to help develop the permanent sockeye salmon hatchery facility.

Status of Work (2004)

In June 2004, a spreadsheet containing the thermal marking induction summary for the 2003 brood year was submitted to SPU. The summary included a description of the marking patterns used for each release group, the start and end date of marking, and release location for each marked group. In March 2005 WDFW provided SPU with a draft report that describes how many fish were marked in each group for the 2003 brood year, the release dates for each marked group, any deviations from the marking plan, and document marks through representative photos of each mark. The draft report will be reviewed and WDFW will produce a final report based on comments by SPU and the AFC.

In the fall of 2004, SPU contracted with WDFW for the brood year 2004 otolith marking program. WDFW established a marking plan for the hatchery based on the goals and objectives of the marking program established by the Anadromous Fish Committee (AFC). The main objectives of 2004 marking program were to mark production fry by release location in the river (lower, middle, and upper) and timing (early, middle, and late), requiring nine marks. Further discussion with WDFW and the AFC resulted in a plan for releasing approximately 25% of the fry from Landsburg during the early and middle periods and the remaining fry below the trap in the lower river. Voucher specimens of otoliths will be collected from each incubator shortly before each hatchery group is released to verify that the planned marking pattern was actually induced on the otoliths.

While not part of this contract, WDFW collected otoliths from sockeye smolts as they were nearing the end of the lake rearing period for the first time in 2004. This allowed comparisons to be made between natural origin and hatchery origin sockeye and to compare treatment groups. A report was issued by WDFW in January 2005. Otoliths were also collected from adult carcasses in the Cedar River and from fish caught in the sport and tribal fisheries in 2004.

Looking Ahead (Planned 2005 Accomplishments)

A summary report will be submitted by WDFW to SPU and the AFC in July 2005, that includes the brood year 2004 marking plan and the results of its implementation. The plan shall include a description of the marking patterns used for each release group, how many fish were marked in each group, the start and end date of marking, release location and dates for each mark group. Results of implementation shall describe any deviations from the marking plan, document marks through representative photos of

each mark. The draft report will be reviewed by SPU and the AFC and WDFW will produce a final report based on comments from the AFC by August 2005.

Financial Summary

The financiThe HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. The HCP commitment for this program in 2004 was $24,100. Due to an accounting error in SPU Accounts Payable $41,582 in commitment funding was paid in 2004. Documentation by the project coordinator shows that an invoice for $24,865 that was submitted in the 13th month of 2004 should have been divided as follows $7,383.23 for the 2004 budget and the remaining $17,481.77 paid in 2005. Instead, the entire invoice was paid in 2004. Outlay in 2005 will be reduced by $17,481.77. This error will not affect SPU's ability to meet its HCP commitments in 2004 or 2005. SPU spent an additional $454 in support of this project.

HCP Program Element: Fry Trapping and Counting (N663403)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

This program supports the operation of a downstream migrant trap in the lower Cedar River, which is used to estimate the number of sockeye fry migrating out of the river each year. Established protocols prescribe the method of sampling each hour's catch over the entire night to insure that regardless of time of capture each fry captured within a night has an equal probability of being sampled. Biological data on the size and migration timing are collected and recorded to characterize these populations. Since sockeye migration overlaps with chinook migration, trapping data is also used to estimate chinook production as well.

Status of Work (2004)

Funding was provided to WDFW through the final year of a two-year agreement to support fry trapping operations on the Cedar River. This agreement provides the full HCP funding commitment for the period. HCP funding is combined with support from other sources to fully fund the activities and analyses associated with the project. Two types of traps have been used; an inclined screen trap, which works best for smaller fry and a screw trap that is more effective at catching larger juveniles. Trapping occurs on the lower Cedar River from January to July each year resulting in estimates of the outmigrant salmonids from the river. This is the only estimate of natural fry production available for the Cedar River. The fry trapping work in 2004 is the 13^{th} year of this evaluation by WDFW.

In September 2004, WDFW provided SPU and the AFC with the final report Evaluation of Downstream Migrant Salmon Production in 2002 from the Cedar River and Bear Creek. The document provided outmigrant estimates of hatchery and natural origin sockeye in the Cedar River for 2002.

Looking Ahead (Planned 2005 Accomplishments)

In January 2005, WDFW provided SPU and the AFC with the final report Evaluation of Downstream Migrant Salmon Production in 2003 from the Cedar River and Bear Creek. The document provided outmigrant estimates of hatchery and natural origin sockeye in the Cedar River for 2003. WDFW has indicated the draft report Evaluation of Downstream Migrant Salmon Production in 2004 from the Cedar River and Bear Creek will be provided to SPU and the AFC in the first half of 2005.

Fry trapping work in the Cedar River will continue in 2005.

Financial Summary

The HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. The HCP commitment for this program in 2004 was $42,180 and the reported commitment expended was $33,040. The commitment was not fully expended in 2004 because funds were withheld pending the delivery of the final reports for 2003 and 2004. Additional costs incurred by SPU in support of this project amounted to $1,488 in 2004.

HCP Program Element: Short Term Fry Rearing (N663405)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The objective of the project is to learn more about the feasibility and effects of short- term rearing on survival and to provide this information to guide future decisions regarding hatchery operations.

Status of Work (2004)

The final release of sockeye fry from the short term rearing study occurred in spring 2004. Fry incubation and ponding took place at the Cedar River Hatchery at Landsburg, which is operated by the Washington Department of Fish and Wildlife (WDFW). Fry were held in four 3'X3'X16' fiberglass raceways located at the adult holding pond site. Reared groups were released after being held and fed to satiation for between 10-18 days. Control groups (unfed fry) were comprised of fry that were released the same day they were removed from incubators, consistent with what has been done in the past at the hatchery. Reared and unfed groups of fry were paired together to form four releases. Each release group involved in the experiment received a unique otolith mark to enable future identification and analysis. The study plan called for roughly 500,000 fry per group; however the exact number depended on the egg takes schedule and fry survival during incubation. The rearing study successfully released approximately 4,537,000 fry in 2004 at river mile 0.1 of the Cedar River.

Initial results from the short term feeding experiment were provided earlier than planned due to the initiative by Dave Seiler of WDFW in collecting smolts from Lake Washington in 2004 and due to additional support from WDFW in processing the samples and doing data analyses. The preliminary findings from the first year of this effort were provided to the AFC in a summary from Steve Schroder, WDFW. They found that fed fry from the hatchery survived at higher rates from fry to smolt than unfed fry from the hatchery that were released at the same downriver location. Fed fry survival to smolt was apparently similar to that of natural origin fry, averaged over the run. Fed fry released in the latter third of the fry migration achieved higher fry to smolt survival rates than those liberated during the first two-thirds of the fry migration period. Additional findings are available in the data summary provided by Steve Schroder to the AFC. These results should be viewed with some caution because they represent findings from a single year.

Looking Ahead (Planned 2005 Accomplishments)

The last fry release for the short-term rearing study was in 2004. Future work will focus on data analysis and final reporting. The first significant adult returns from the study are expected to begin in 2005.

Financial Summary

The HCP provides support for this program for HCP Years 1-4. The HCP commitment for this program in 2004 was $12,050 and the total commitment amount expended was $13,375.

HCP Program Element: Lake Washington Plankton Studies (year-round) (N663406)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The intent of this funding has changed from zooplankton monitoring to ongoing juvenile surveys designed to provide estimates of abundance of populations of sockeye, smelt and stickleback as well as to provide size information. These surveys are important to understanding relationships between food supply (zooplankton) and planktivores, particularly as numbers of sockeye increase.

At the June 2002 Anadromous Fish Committee (AFC) meeting, members recommended to the Parties to the Landsburg Mitigation Agreement (LMA) that funding for intensive zooplankton monitoring in HCP Year 2 totaling $46,400 be used instead for juvenile sockeye surveys . HCP funding was not needed as the University of Washington was conducting zooplankton surveys with foundation funding as part of a long term research project. These surveys provided the information on food supply that was needed for the sockeye monitoring program.

In 2003 the AFC again recommend that funding for intensive zooplankton monitoring be used instead to support a proposal by Dr. Dave Beauchamp to conduct a fall survey to enumerate and obtain growth information of juvenile sockeye in Lake Washington with funding from the program element Lake Washington Plankton Studies.

Status of Work (2004)

In 2004, the AFC recommended using zooplankton monitoring funds for two proposals by Dr. Dave Beauchamp, University of Washington. The proposals were to conduct spring and fall midwater trawl & hydroacoustic surveys in Lake Washington.

The spring midwater trawl & hydroacoustic surveys continued a long-term effort to enumerate and size sockeye close to the time that they leave the lake as smolts. These presmolt surveys provide valuable information on in-lake survival, growth and abundance.

The fall midwater trawl & hydroacoustic surveys are conducted to enumerate and obtain growth information for sockeye in Lake Washington. In addition, the surveys provide valuable information on the size of the longfin smelt and threespine stickleback populations, the other major pelagic planktivores in the lake.

A paper was published in Transactions of the American Fisheries Society (Beauchamp et al 2004) that evaluated consumption of zooplankton in Lake Washington in early spring. The study was conducted when a record number of sockeye fry entered Lake Washington and developed consumption estimates based on dispersal, feeding and survival scenarios. Using the most realistic assumptions, the authors estimated that total consumption of all prey by sockeye represented 5% of the average monthly biomass of *Cyclops* during March and early April when their availability was lowest. The authors note that annual variation in other planktivores and in zooplankton abundance should be considered in the adaptive management program.

Looking Ahead (Planned 2005 Accomplishments)

The HCP reduced the scope of zooplankton surveys after 2004 to focus on spring surveys only.

Consequently, the HCP funding level for zooplankton sampling is lower beginning in 2005. This funding will begin to support plankton surveys as the other funding source has ended its support for UW zooplankton surveys in 2004. The University of Washington is being asked to conduct the spring surveys with the HCP funding. The difference between commitment levels and actual expenditures over the past four years will now be used to continue presmolt surveys for as long as possible. At the January 20, 2005 AFC meeting, members recommended continuing the spring midwater trawl & hydroacoustic surveys to enumerate and size sockeye close to the time that they are leaving the lake. It is unlikely that the fall survey will be conducted in 2005.

In June 2005, SPU and the AFC should receive a draft report for the spring 2004 surveys that include: summary tables of species-specific catch by area and depth; hydroacoustic estimates of fish densities by size class, depth, and area; and size data (mean lengths and length frequencies) for each species. The final report shall be submitted to Seattle Public Utilities on or before June 30, 2005.

In June 2005, SPU and the AFC should receive a draft report for the fall 2004 surveys that include: summary tables of species-specific catch by area and depth; hydroacoustic estimates of fish densities by size class, depth, and area; and size data (mean lengths and length frequencies) for each species. The final report shall be submitted to Seattle Public Utilities on or before June 30, 2005.

A draft of the final report for the spring 2005 surveys containing a summary of activities will be submitted to SPU by the UW on or before November 1, 2005. The report will include summary tables of species-specific catch by area and depth; hydroacoustic estimates of fish densities by size class, depth, and area; and size data (mean lengths and length frequencies) for each species. Comments on the draft will be submitted to the UW from SPU by November 30, 2005. After responding to comments, the final report shall be submitted to SPU on or before December 31, 2005.

Financial Summary

The HCP provided support for year-round zooplankton surveys for HCP Years 1-4. The HCP commitment for this program in 2004 was $48,200 and the commitment amount expended was $35,485. SPU spent an additional $2,443 to support this project. The Parties have agreed to use zooplankton funding for juvenile surveys and this has allowed funding to be carried forward to extend these surveys to 2005 and beyond. Zooplankton surveys during years 1-4 was funded from a non-HCP source.

HCP Program Element: Adult Survival Distribution, and Homing Studies (N663407)
HCP Program Category: Sockeye Monitoring and Evaluation

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The purpose of this activity is to collect otoliths from a representative sample of sockeye spawning in the Cedar River so this information can be used to evaluate the hatchery and natural origin returns. All sockeye released from the Cedar River Hatchery are exposed to temperature changes during incub ation that result in marking patterns on the otolith bone. When the otolith samples are analyzed, they provide the data that allows evaluation of marked groups originating from the Cedar River Sockeye Hatchery. Some examples of analyses that will be or have been done are to measure fry to adult survival of hatchery-produced fish by release location and timing, determine the hatchery's contribution to sport and tribal fisheries, assess the proportion of hatchery-origin sockeye spawning in the river, evaluate the proportion of hatchery-origin fish that are used for broodstock, assess the proportion of hatchery-origin sockeye that are collected at Landsburg, monitor the effects of fry release strategies on the distribution of hatchery-origin sockeye spawning in the Cedar River, and to assess straying in Bear Creek.

Data from these studies will be used to evaluate performance of hatchery releases, compare hatchery and naturally-produced sockeye and to evaluate straying levels. This information will be used to guide management of the hatchery program to meet its goals.

Status of Work (2004)

Funding under this agreement was used to collect otoliths from sockeye in the Cedar River. Samples and biological information were collected from adult sockeye carcasses in the Cedar River from October 2004 into January of 2005. Sampling goals were to collect about 300 specimens each week with the sex ratio of the samples reflecting the sex ratio of available carcasses. The goal was to collect samples from multiple sites within each section of the river, with approximately 50% of their samples from the lower river, 25% from the middle river, and 25% from the upper river locations. Biological data included the sample location, fish condition, sex, length, saggital otoliths, and pectoral fin ray samples.

Otolith samples were also collected from sockeye trapped at the weir (RM 6.5) and used for broodstock for the hatchery. In addition, some broodstock that were captured at the Landsburg Dam fish passage facilities were marked and subsequently sampled to determine the origin of sockeye attempting to pass the dam.

WDFW also received some funding to carry out the third year of a pilot study to examine the consequences of adult fish behavior, sex and size on carcass recovery rates. The field crews marked sockeye at the broodstock collection weir, released them and then noted recoveries in subsequent carcass sampling.

WDFW provided the Anadromous Fish Committee (AFC) with two data summaries from otoliths collected in 2003. One summary described the origin of a sample of sockeye captured at the Landsburg Fish Passage Facility during its first year of operation in 2003. Otoliths were collected by Fish Passage staff and were from fish that were transported to the hatchery for broodstock or from mortalities at the ladder. Analysis of the otoliths suggested these fish were approximately 64% natural origin.

The second summary was a draft analysis of how fry release location within the Cedar River affects spawning location of subsequent adult returns. The data suggested that fry release location does

influence adult distribution, increasing the likelihood that fish will spawn in the area where they were released as fry. However, the data also showed this effect was limited and that many of the returns spawn in areas that were different from their fry release locations. This information is being used to plan juvenile releases so that adult hatchery origin returns can approximate the natural distribution throughout the river.

Looking Ahead (Planned 2005 Accomplishments)

WDFW will provide the AFC with a sockeye otolith collection report that will include all data collected on adult fish that were sampled during the 2004 return year. A draft of the report will be provided to the AFC by July 1, 2005 and the final should be available by September 1, 2005.

Otolith collection and analyses are planned to continue in 2005.

Financial Summary

The HCP provides support for this program for HCP Years 1-8, 24-27 and 42-45. The HCP commitment for this program in 2004 was $48,200; the total commitment amount expended was $49,730.00.
In addition, SPU spent $2,773 in support of this project.

HCP Program Element: Phenotypic and Genetic Studies (N663408)
HCP Program Category: Sockeye Monitoring and Research

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

In 2002 the Anadromous Fish Committee (AFC) recommended that funding for this program be used to support a proposal to evaluate the timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River. The Parties agreed with this recommendation. This study is being conducted as a master's thesis project by Jenny Newell under the supervision of Dr. Tom Quinn (School of Aquatic and Fishery Sciences, University of Washington). The study is expected to generate information to better understand sockeye movement, distribution, and lake entry timing in relation to the timing and location of spawning. The information is expected to be useful to fishery managers as they consider how future fisheries should be structured to control effects of harvest on sockeye in the Lake Washington Basin. The need for this research is identified in the draft Adaptive Management Plan for the Cedar River sockeye hatchery.

Status of Work (2004)

Jenny Newell presented results from the first year (2003) of the study to the AFC on December 18, 2003. Results comparing timing of entry to L. Washington tributary systems and lake entry timing showed little correlation during the first year. Limited data suggested that northern tributary sockeye entered the lake later than those returning to the Cedar River. Special temperature-detecting tags allowed researchers to determine the depth that sockeye held in the lake and were used to determine stream entry timing.

In 2004, the project completed its second consecutive year of tagging sockeye salmon at the Hiram Chittenden Locks. Jenny Newell presented SPU with a written summary of tagging results in March 2005. Researchers tagged 2,922 sockeye with disk tags and 75 with acoustic transmitters. In addition, they recorded the sample date, sex and length data. Scale samples were collected. Stationary receivers were placed strategically to track fish movement throughout the lake. Disc tags were recovered with the help of staff from various agencies and the public. Additional transmitters were installed this year with a goal of determining if significant numbers of sockeye die while they are in Lake Washington. This has been one of several reasons offered to explain discrepancies between estimates of sockeye passing the locks and later estimates of spawning sockeye.

Looking Ahead (Planned 2005 Accomplishments)

The project will enter its final year in 2005 and will focus on the analysis of results from 2003 and 2004. A final report is expected by June 30, 2006.

The Principal Investigators have sent a manuscript for review on the findings from the temperature-detecting tags in 2003 to the Canadian Journal of Zoology for review. The Principal Investigators are working on the second part of the study, investigating timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River. A draft report is expected in April 2005.

Financial Summary

The HCP cost commitment for this program in 2004 was $36,150. The total commitment amount expended was $36,351 ($24,273 for acoustic transmitters and $12,078 goods and services). In addition, SPU spent $2,063 in supporting this activity.

HCP Program Element: Anadromous Fish Committee
HCP Program Category: Program Management

Contact: Bruce Bachen, Senior Fish Biologist and Paul Faulds, Fish Biologist, Water Management Section

Objectives and Goals

The Anadromous Fish Committee (AFC) provides advice and consultation to the City and the other Parties of the Landsburg Mitigation Agreement (LMA) relating to the implementation of the LMA. The primary objective of the LMA is to implement biologically sound measures that assist in the recovery and persistence of healthy, harvestable runs of sockeye, coho, and chinook salmon and steelhead trout in the Cedar River. The LMA commits the City to long-term measures to help restore anadromous fish runs and mitigate for the blockage at Landsburg Dam. The AFC serves as a forum for coordinating and communicating information on the status, condition, and trends of anadromous fish stocks in the Cedar River and provides guidance with the implementation and oversight of interim and long-term mitigation measures for these stocks.

In 2004, nine committee meetings were held. Membership included representatives from: US Fish and Wildlife Service, NOAA Fisheries, Washington Department of Fish and Wildlife, City of Seattle, Muckleshoot Indian Tribe, Puget Sound Anglers-Lake Washington Chapter, Washington Council of Trout Unlimited, Long Live the Kings, Washington Trout and the public-at large.

Membership

There were no changes in AFC committee membership in 2004. There were nine meetings held in 2004. 80% of the members attended 7 or more meetings. Monthly meetings were cancelled when unnecessary.

Status of Work (2004)

The AFC recommended and/or supported the following items:

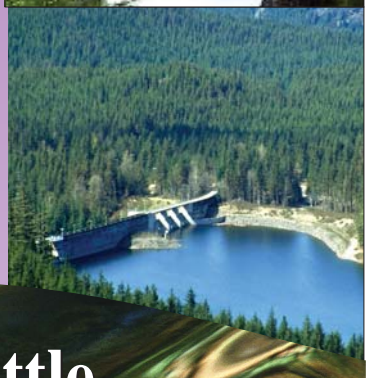
- Recommended that the LMA Parties approve $4,352 for year two of a WDFW study on the genetic relationships of anadromous and nonanadromous *Oncorhynchus mykiss* in Cedar River and Lake •
- Washington to determine the implications for steelhead recovery planning.
- Recommended that the LMA Parties approve $7,070 for additional telemetry equipment to support continued UW research studying adult coho salmon movement and spawning activity above Landsburg Dam.
- Recommended that the LMA Parties approve $17,804 for a NOAA / UW study to monitor the distribution and size of resident and anadromous juvenile species above the Landsburg Dam during the summer and fall.
- Recommended that the LMA Parties approve $7,512 in funding for a NOAA / UW study to monitor nutrient levels in the river as a component of the recolonization studies above the Landsburg Dam.
- Recommended that the LMA Parties approve $7,000 to improve the trapping ability at the Landsburg Fish Passage Facility for research and monitoring.
- Recommended that the LMA Parties approve $10,000 to evaluate the potential for trapping Chinook, coho, and steelhead fry and smolts moving through the Landsburg Fish Passage Facilities.
- Recommended that the LMA Parties approve $5,000 to support genetic sample collection, tagging and collection of biological data from coho and chinook salmon as they pass Landsburg Dam. This work is essential to the evaluation of recolonization of habitat above the dam.
- Recommended that $50,000 for adult PIT tag detection equipment at the Locks previously approved for expenditure in 2004 be spent in 2005, due to project delays.

- Recommended that the LMA Parties fund two proposals by Dr. Dave Beauchamp (UW) using uncommitted zooplankton funds from 2004. Zooplankton work by Dr. Dan Schindler under non-HCP funding continued through 2004 and meets the needs of this project. The proposals included spring and fall midwater trawl & hydroacoustic surveys in Lake Washington. The spring surveys added to a long-term series of assessments of population size and provided size data on sockeye just prior to emigration from the lake. This information is used to evaluate in-lake survival and food supply sufficiency. The fall midwater trawl & hydroacoustic survey was done to enumerate sockeye juveniles and to obtain growth information for sockeye in Lake Washington. In addition, the surveys provide valuable information on the size of the longfin smelt and threespine stickleback populations, the other major pelagic planktivores in the lake. Longfin smelt population size fluctuates on a two year cycle and this species probably plays an important role as a buffer species in terms of predation on salmonids.
- The AFC was briefed by Hans Berg on the WRIA 8 Chinook genetics study by King County and Washington Department of Fish and Wildlife. The AFC supported peer review of the study design and this recommendation was subsequently conveyed to the WRIA 8 Technical Committee. Further discussions were held between Julie Hall of the WRIA 8 Technical Committee and the AFC regarding potential reviewers and the need for including additional samples into the study design. To improve the study, members assisted in coordinating the collection of additional Chinook genetic samples from hatcheries located at Issaquah, Soos Creek, and the University of Washington as well as samples from Chinook carcasses in the Cedar River.
- The AFC recommended using sockeye collected at Landsburg for the Cedar River broodstock program to help achieve the hatchery egg take goal. This action was recommended because unusually high, early-season flows in the Cedar River interfered with the operation of the broodstock collection facility at RM6.5 and previous sampling indicated that the sockeye at Landsburg were mostly natural origin returns.
- The AFC approved the 2004 weir operating protocols to protect chinook and approved the WDFW report evaluating the effectiveness of the weir protocols in 2003.
- The AFC adopted the 2004 egg take goal of 17.2 million for the Cedar R. hatchery.
- The AFC supported the 2004 thermal-marking plan for the interim hatchery including the release strategy that marked fry by location of release in the river (upper, middle, and lower) and timing (early, middle, and late).
- The AFC supported continued funding for WDFW to collect adult sockeye otoliths from the river and hatchery in 2004 after discussing of whether the funding would be better spent on reading the otoliths collected in previous years that are awaiting processing. After assurances that the funding would likely be available to continue processing otoliths and analyzing the data, the AFC agreed to continue supporting adult otolith collection in the Cedar River.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, the AFC will continue to advise SPU on the replacement hatchery including the facilities design and other program elements, including increased focus on preparing for adaptive management. The AFC will be asked for their recommendation on the operating protocols, adaptive management plan, capacity analysis and design when SEPA is completed. The AFC will continue to advise the City on fish passage and interim hatchery operations. A number of proposals under the Interim Mitigation Program for Chinook, Coho, and Steelhead were recommended for funding in 2005. The AFC will review results of ongoing monitoring activities, including the anticipated completion of the adult distribution study conducted by Jenny Newell. Finally, the AFC will continue to encourage timely discussion of issues facing fish populations in the Cedar River, providing a multi-agency and stakeholder forum for these discussions.

Instream Flow Summaries



City of Seattle

Seattle Public Utilities & Seattle City Light

Instream Flows Background

The City of Seattle manages the Cedar River water supply to: (1) provide its customers in the region with a high quality, reliable, and adequate supply of drinking water; (2) protect aquatic resources in the Cedar River; and (3) provide a measure of flood protection and electrical power generation compatible with the City's primary water supply mission. The instream flow management strategy commits the City to a binding instream flow regime designed to improve habitat conditions for chinook, coho, sockeye salmon, and steelhead trout in the regulated portion of the Cedar River.

Based on extensive study and analysis of the needs of all life stages for each of the four anadromous species, the flows provide habitat for spawning, incubation, rearing, migration and adult fish holding. The flow regime includes, not only minimum instream flow requirements, but also adaptive provisions for allocation of supplemental flows above minimums in accordance with real time hydrologic conditions and biological need. Instream flow management is guided by the multi-agency Cedar River Instream Flow Commission (IFC).

It is important to note that, as used in the HCP, the term *minimum flow* does not connote an instream flow that provides only minimum habitat or benefit for fish. Rather, such flows represent commitments to minimum levels of instream flows that the City will allow to occur. These *minimum* flows are designed to provide substantial benefit and habitat for the fish species addressed. As used in the HCP, *supplemental flows* are increases above minimums that are believed to provide even greater benefits during certain times of the year. The combination of minimum and supplemental flows is termed *guaranteed flows.*

In addition to these guaranteed river flows, the HCP instream flow management commitments provide the following measures:

- Limit rates of decrease in river levels (down-ramping) to minimize the risk of stranding fish in shallow areas
- Guaranteed flows in the "bypass reach" between the Masonry Dam and the Cedar Falls Hydroelectric Plant
- Create the Cedar River Instream Flow Commission (IFC), comprised of representatives from federal, state, local and tribal resource agencies, which will assist the City in carrying out its responsibilities for managing the Cedar River for fish and people
- Develop and implement a research and monitoring program (known as "Supplemental Studies") to support SPU and the IFC in the management of water supply and river flows in the Cedar River
- Move the measurement (compliance) point for flows in the lower river from Renton, at the mouth of the Cedar River, to Landsburg to more closely align SPU's responsibilities with its capabilities and authority and to provide more natural flow patterns for aquatic resources in the lower river
- Provide funding for: 1) improvements at the Ballard Locks to increase survival of young fish as they migrate to sea; 2) to protect and restore habitat in the Cedar River Basin downstream of the Landsburg
- Diversion Dam; 3) to develop water conservation messages for the public related to protecting fish and fish habitat; and 4) to modify hydroelectric facilities at Cedar Falls and Masonry Dam for additional fish protection.
- Evaluate the potential permanent use of "dead storage" in Chester More Lake reservoir (water below the elevation of gravity out-flow) for improved instream flows and water supply

HCP Program Element: Implementation of the Cedar River Instream Flow Agreement and Workings of the Instream Flow Commission
HCP Program Category: Instream Flow Management

Contact: Alan Chinn, Water Resource Manager; Rand Little, Senior Fisheries Biologist, Water Management Section

Objectives & Goals

The City of Seattle influences river flows in the Cedar River through its water supply and hydroelectric operations within the municipal watershed. Water from the Cedar River is used by about two-thirds of the City's 1.3 million customers in King and Snohomish Counties. The objective of the Instream Flow Agreement of the HCP is to provide beneficial conditions for instream resources, while preserving Seattle's water supply and power generation capabilities. We intend to meet this objective, using an extensive, scientific information base coupled with an adaptive approach to instream flow management that is supported by continuing research, management flexibility and effective oversight.

Status of Work (2004)

The ***Instream Flow Agreement (IFA)*** established a body to assist the City in carrying out its river management responsibilities. ***The Cedar River Instream Flow Commission (IFC)*** was first convened in July 2000, and has met, on average, every month since then. In HCP Year 4, the IFC participated in real-time stream flow management decisions, guided the development and implementation of supplemental studies and other technical analyses, and monitored compliance with the IFA. Meetings are chaired by SPU (Alan Chinn, chair; Rand Little, vice-chair) and have been very well attended. Organizational membership is as follows:

NOAA Fisheries – Voting Member
U.S. Fish and Wildlife Service – Voting Member
Washington Department of Fish and Wildlife – Voting Member
Washington Department of Ecology – Voting Member
Muckleshoot Indian Tribe – Voting Member
City of Seattle – Voting Member (representing both Seattle Public Utilities and Seattle City Light)
U. S. Army Corps of Engineers – Non-voting Member
King County – Non-voting Member

Preliminary information from WDFW indicates that the Cedar River produced relatively robust numbers of juvenile chinook and sockeye in the spring of 2004, indicating good conditions for salmon spawning, incubation and emigration (Table 1 and Figure 2). Although the return of spawning adult steelhead in the spring was again disappointing, all steelhead redds were protected from dewatering with the application of supplemental stream flows.

With relatively early return of the fall rains in 2004, stream flows were held at levels equal to or greater than supplemental levels prescribed for the fall. Flood storage capacity was maintained at sufficient levels throughout the fall and early winter to moderate the detrimental effects of several large storm events that caused substantial egg mortality in many river systems in the Puget Sound region. Guaranteed stream flows were held at augmented levels throughout the fall and winter to protect Chinook redds established in relatively shallow habitat during an unusually large mid-September peak flow event.

Although stream flows appear to have been beneficial for salmon spawning and incubation, watershed conditions became very dry by early March with record low snowpack and record low mid-winter precipitation. Unless conditions change, it will be challenging to refill reservoir storage in the spring of 2005.

The HCP year 4 ***Annual Compliance Report*** was prepared for the IFC and delivered in March 2005. The report demonstrates that SPU was in full compliance with all applicable IFA minimum flow provisions. Four out of the five annual supplemental flows volumes were provided in 2004. With early snowmelt and relatively dry conditions developing in the late spring and early summer, the IFC agreed to forgo allocation of the ***non-firm supplemental summer block*** of water to help better position the system for meeting the needs of returning salmon in the fall. The ***firm supplemental summer block*** of water was fully allocated and was sufficient to provide 100% dewatering protection for all steelhead redds throughout the steelhead incubation period.

During 2004, we experienced five distinct events in which downramping provisions were slightly exceeded at Landsburg Dam. Two of these events were directly associated with operation of new downstream fish passage and screening facilities at the Landsburg Dam. Three events were the result of inadvertent minor operational errors. (Please see Page 10 in the attached HCP Year 3 Annual Flow Compliance Report).

The HCP also directs SPU to attempt to manage the water supply system in manner that results in an mean annual Cedar River diversion within or below a range of 98 to 105 mgd range for the first five to ten years of the HCP. ***In calendar year 2004, mean annual diversion was 86 mgd*** .

With the passage of anadromous fish above the Landsburg Diversion Dam came new operating requirements below Masonry Dam and the Cedar Falls Powerhouse. A new fish flow valve installed in the Masonry Dam in early 2003 began providing continuos flow of at least 30 cfs in the "canyon reach" (which is below the lower Cedar Falls ending at Cedar Falls Powerhouse) starting in September 2003. Also, new downramping requirements below Masonry Dam and below Cedar Falls Powerhouse were initiated in September 2003. During the 2004 compliance period, we experienced no instream flow or downramping violations in the "canyon reach". However, we experienced two short-lived flow reductions during daylight hours during a specified no daytime downramp period in the river downstream of the Cedar Falls Powerhouse. Each exceedence was assoicated with power generation facilities. Please see refer to the attached Annual Instream Flow Compliance Report for a detailed discussion of these events.

Looking ahead: Planned 2005 accomplishments:

The IFC will continue its work in all of the areas that it has been involved with so far. Considerable attention will be focused on advancing the research and technical study program (see following section).

Financial Summary:

This is not an HCP cost commitment category. Thus there is no financial summary for this activity.

Figure 1: Cedar River Mean Daily Stream Flow – 2004

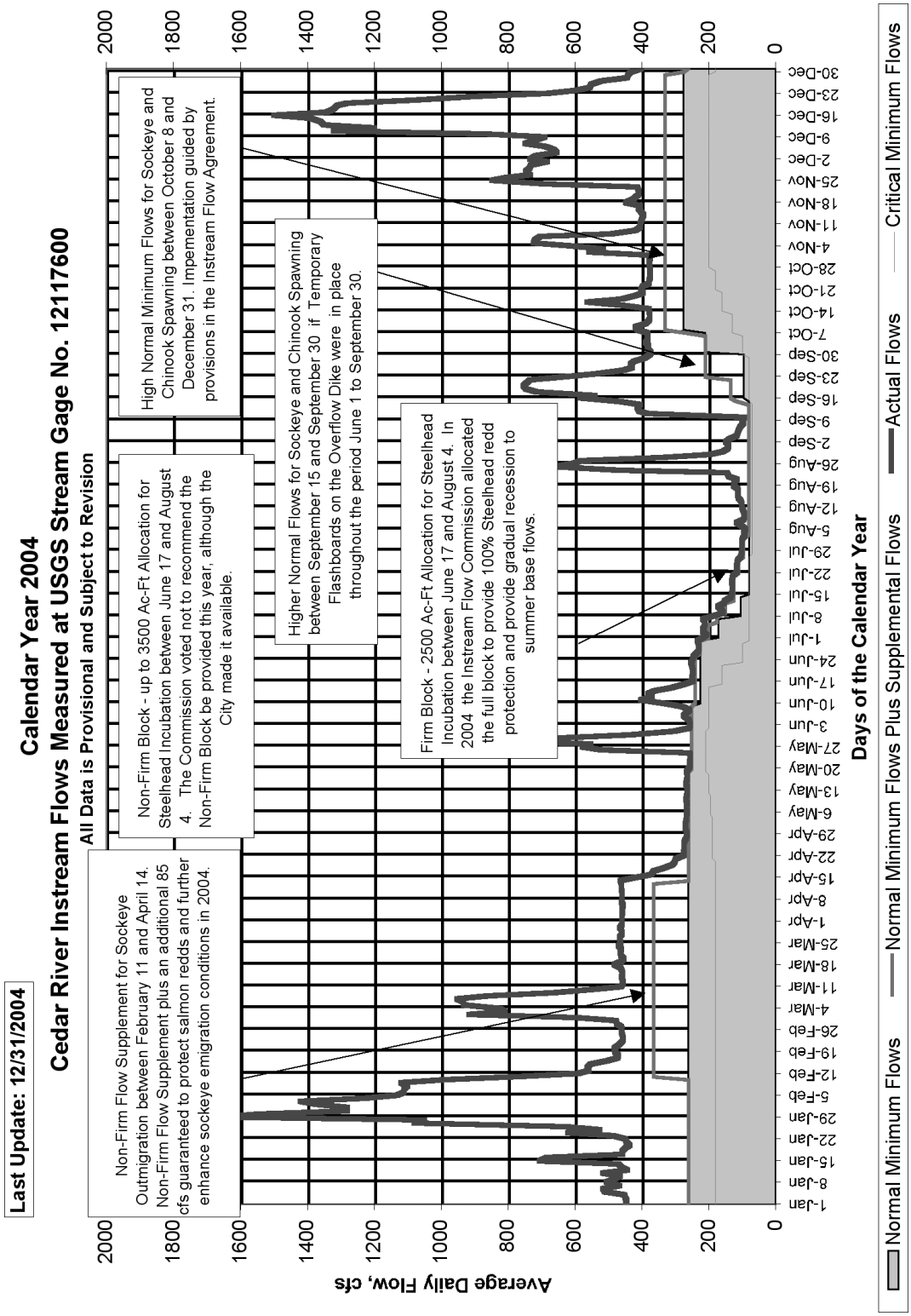


Table 1: Lake Washington Juvenile Chinook Salmon Production

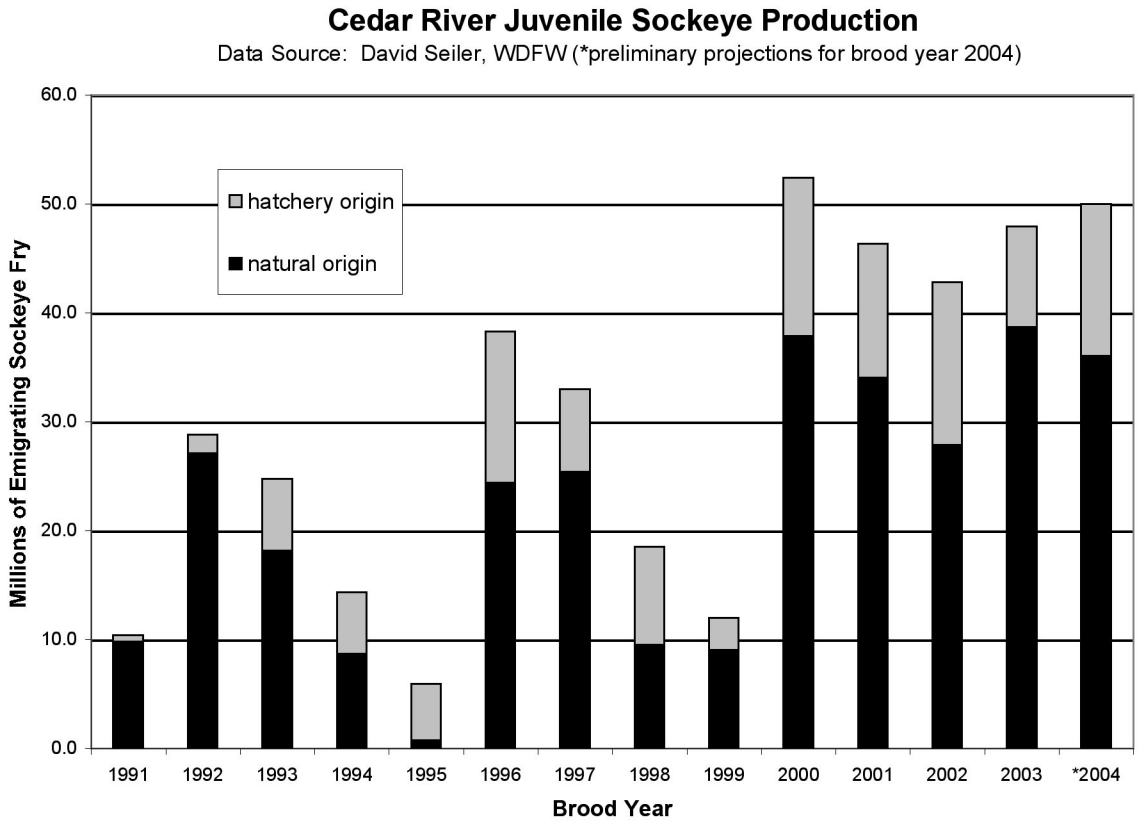
Cedar River Juvenile Chinook Production
Source: David Seiler, WDFW (2004 data preliminary)

Outmigration Year	Estimated No. of Spawning Females	Estimated No. of Juvenile Emigrants	No. of Juveniles per Spawning Female
1999	173	80,932	468
2000	180	64,723	360
2001	53	32,249	608
2002	395	126,862	308
2003	266	231,527	870
2004	319	120,876	379

Bear Creek Juvenile Chinook Production
Source: David Seiler, WDFW

Outmigration Year	Estimated No. of Spawning Females	Estimated No. of Juvenile Emigrants	No. of Juveniles per Spawning Female
1999	159	15,148	95
2000	293	32,220	110
2001	133	11,157	84
2002	276	22,390	81
2003	N/A	17,313	N/A

Figure 2: Cedar River Sockeye Salmon Fry Production



HCP Program Element: Chinook/Supplemental Biological Studies and Steelhead Redd Monitoring Projects
HCP Program Category: Instream Flow Monitoring and Research

Contact: Rand Little, Senior Fisheries Biologist; Karl Burton, Fisheries Biologist; Water Management Section

Objectives and Goals

The HCP instream flow management program on the Cedar River attempts to provide certainty for instream resource protection through the implementation of the guaranteed flow regime based upon an extensive body of biological information. The program also provides flexibility to improve and adapt management practices, as new information becomes available. The HCP provides this flexibility by placing annual limits on municipal diversions, providing support for continued study, and by consulting with the Cedar River Instream Flow Commission (IFC) in using new information from a suite of supplemental studies to adapt and improve instream flow management practices in the future.

Soon after its inception in July of 2000, the IFC developed the following objectives for the supplemental studies in support of ongoing efforts to adaptively manage instream flows in the Cedar River:

- Continue to increase our understanding of the relationships between stream flow and habitat conditions in the Cedar River, with an emphasis on Chinook salmon and other naturally reproducing salmonids
- Support effective allocation of the "firm" and "non-firm" blocks of water during the summer
- Help guide the allocation of available water above guaranteed levels
- Help address several remaining technical issues that emerged in the later stages of the HCP development

From the objectives above, the IFC developed 9 study topic areas and 19 specific study questions. The IFC spent approximately one year refining and prioritizing the study questions and developing preliminary study scopes for each question. The study topics and questions address four major areas of interest:

- Chinook and sockeye spawning and incubation
- Chinook early life history
- The relative effect of stream flow on water temperature
- The relationships between stream flow and natural ecological processes that shape and maintain riparian and in-channel habitat in altered systems.

This work is summarized in a draft document that was finalized in September of 2001 entitled: *Cedar River Instream Flow Management: Biological Research and Monitoring.* This product is considered a living document that will continue to be revised as it is used to guide the implementation of supplemental studies.

Status of Work (2004)

During early 2004, the IFC briefly reexamined the study questions and affirmed the current prioritization of study efforts.

A number of "high" priority instream flow studies have been conducted in HCP years 1 through 4. One of the first studies implemented by the IFC was an investigation of temporal and spatial distribution of Chinook salmon spawning activity. This work, initially supported with funds from the HCP, began

receiving additional funding support from the King Conservation District and the King County Department of Natural Resources in 2001. SPU worked with WDFW, the Muckleshoot Indian Tribe and the King County Department of Natural Resources to monitor Chinook spawning activity, collect, age, sex and size data from carcasses and record interactions with spawning sockeye in 2000, 2001, 2002, 2003 and 2004. SPU and its research partners were successful in obtaining grants from the King Conservation District and from the King County Department of Natural Resources for work conducted in between 2001 and 2004. These grants covered nearly all costs incurred by SPU for this project during the 2001, 2002 and 2003 and 2004 and thus reduced the required amount of Cedar HCP funding to complete investigation this topic. Annual project reports are available for 2000, 2001, 2002 and 2003. The 2004 report is expected to be complete by late spring of 2005.

Since 1991, WDFW has conducted a major sampling effort to estimate the number of juvenile sockeye salmon emigrating from the Cedar River each year. WDFW, King County, SPU and others have provided funding support for this work. In 1998, the program was augmented to include estimates of the number of all juvenile salmonids migrating from the river. The project continued in 2004 with funds from King County and the Landsburg Mitigation component of the Cedar River HCP. Information from this project is very useful in addressing several instream flow supplemental study questions. This information is perhaps of most immediate interest in addressing one of the top priority questions identified by the IFC: "Are the numbers of recently emerged Chinook fry that migrate out of the Cedar River [as opposed to remaining to rear in the river] correlated with stream flow?" The IFC has identified the continued collection of Chinook emigration data by WDFW as a key element in addressing this question. Supplemental study funds may be allocated in the future to help support continued juvenile emigrant enumeration and to further investigate potential relationships between stream flow and Chinook early life history in the Cedar River.

The IFA provides for "firm" and "non-firm" volumes of water to supplement minimum flows during the steelhead incubation period. In order to support decision making regarding this water, SPU, in collaboration with WDFW, continued annual steelhead spawning and incubation studies as provided in Section E. 5. of the Instream Flow Agreement. Each year, the IFC has used this information to guide the allocation of the supplemental blocks of summer water in a manner that protects all steelhead redds in the Cedar River from dewatering. Final reports are available for the results of studies conducted in 2000, 2001, 2002, 2003 and 2004.

At the direction of the IFC, SPU entered into an agreement with the U. S. Fish and Wildlife Service to conduct juvenile Chinook rearing habitat electivity studies on the mainstem Cedar River during the spring of 2002. This study will supplement previous collaborative IFIM, PHABSIM analyses conducted on the Cedar during the late 1980s. Due to relatively high flows during the spring of 2002, and the need for additional information, further field work was conducted in the spring of 2003 and 2004. We expect a draft report on the juvenile Chinook habitat electivity studies to be submitted to the IFC in 2005. We anticipate that this work will help guide the second phase of the study; assessment of the effects of stream flow on juvenile Chinook rearing habitat availability.

In 2002, the IFC initiated the first phase of an interesting and challenging effort to explore the relationships between stream flow and natural ecological processes that shape and maintain riparian and in-channel habitat in altered systems. The first step in this process is to compare a wide range of hydrologic characteristics exhibited by a natural, unregulated flow regime in the Cedar with those exhibited by the present regulated regime. During extensive discussions in 2002, it became clear that developing robust "natural" and "regulated" flow data sets for this exercise would be a significant effort. After much discussion and work, the IFC agreed to contract independent expertise to help guide the development of synthetic "natural" and "regulated" flow data sets. This work was commissioned in early 2003 and a final report providing recommendations on appropriate technical approaches to

compiling the data sets was submitted to the IFC in late 2003. In 2004, SPU staff developed a work plan and initial methodology for compiling the flow data sets. Draft mean daily flow data sets and associated documentation are expected to be submitted to the IFC for review in late 2005.

Looking Ahead (Planned 2005 Accomplishments)

Steelhead and Chinook spawning and incubation studies will continue in 2005. SPU, in collaboration with WDFW and King County, has submitted another grant proposal to the King Conservation District to fund Chinook spawning surveys in 2005.

As mentioned above, the IFC believes that it is important for WDFW to continue enumerating juvenile Chinook as they migrate out of the river. The current juvenile salmon emigration monitoring program includes enumeration of all emigrating juvenile salmonid species in the Cedar River and Bear Creek. This information, combined with accurate estimates of spawning escapement, forms a fundamental building block for monitoring salmonid conservation efforts in the Lake Washington Basin.

Juvenile Chinook rearing habitat electivity studies are scheduled to be completed in 2005. Juvenile Chinook habitat availability studies are expected to be initiated in the spring of 2006.

The IFC will be working with SPU staff and independent hydrologic consultants to generate initial "unregulated" and "regulated" mean daily flow data sets for the Cedar River before the end of 2005. Once these data sets have been created, we will assess relative differences in their respective hydrologic characteristics and explore the possible ecological significance of these differences.

Financial Summary

The Year 4 cost commitment for Chinook Studies was $202,440 and $36,150 for Steelhead Redd Monitoring. The actual expenditures in HCP Year 4 were $112,726 for Chinook Studies and $15,817 for Steelhead Redd Monitoring Studies. Successful efforts to secure grant funding for the Chinook spawning studies, a delay in a portion of the juvenile Chinook rearing studies and a very small return of adult steelhead in 2004 resulted in expenditures below anticipated budget levels.

HCP Program Element: Streamflow Gaging and Technical/Engineering Studies
HCP Program Category: Instream Flow Monitoring and Research

Contact: George Schneider, Water Resources Manager and Alan Chinn, Senior Civil Engineer, Water Management Section

Objectives and Goals

To effectively perform water management responsibilities as well as monitor compliance with conditions of the Instream Flow Agreement, Seattle participates in a ***cooperative stream gaging program*** with the USGS. The IFA requires the maintenance of certain existing stream gages and the installation and maintenance of some new gages. The ***Accretion Flow Study***, a component of the instream flow research and monitoring program that will likely require installation of temporary stream gages, is intended to validate certain hydrologic assumptions that were used in the development of the instream flow regime. The objective of the ***Switching Criteria Study*** is to develop criteria that would be used by the IFC to help decide the appropriateness of moving from a normal to a critical instream flow regime, and to decide between high-normal and low-normal flow regimes in the fall.

Status of Work (2004)

Streamflow Gaging

Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period.

Accretion Flow Study

The Instream Flow Commission (IFC) and other key participants met at several monthly IFC meetings to discuss the need for the Accretion Flow Study and to design a study plan to carry out continuously over the next 10 years or so. In general, the study will:

- specify the precise inflow assumptions to be evaluated,
- establish and implement a long-term monitoring protocol,
- establish analytical objectives; identify any apparent long-term differences from the assumptions, and perform additional investigations and analyses to identify causes of any differences from the assumptions.

An initial level of accretion flow monitoring has already been started. In the lower Cedar River, Seattle maintains three existing stream gages through its cooperative stream gaging program with the USGS. These stream gages continuously record mean daily streamflow data in the Cedar River just upstream of the Landsburg dam (USGS Stream Gage No. 12117500 at river mile 23.4), immediately downstream of Landsburg dam (USGS Stream Gage No. 12117600 at river mile 20.4) and at a location in Renton near the mouth of the river (USGS Stream Gage No. 12119000 at river mile 1.6). Seattle also continuously monitors and records average daily water diversions made at the Landsburg Facilities (river mile 21.9). In addition, Seattle operates and maintains an existing weather station at Landsburg. The data collected at these existing monitoring stations are providing useful information to help characterize the accretion flow patterns in the lower Cedar River. The data will be continuously collected over the study period for analysis purposes.

Figure 1 below is an example of a draft conceptual monitoring and tracking graph that was prepared and regularly updated for the IFC during 2004 using the provisional real-time streamflow data collected at USGS Stream Gage No. 12117600 and USGS Stream Gage No. 12119000.

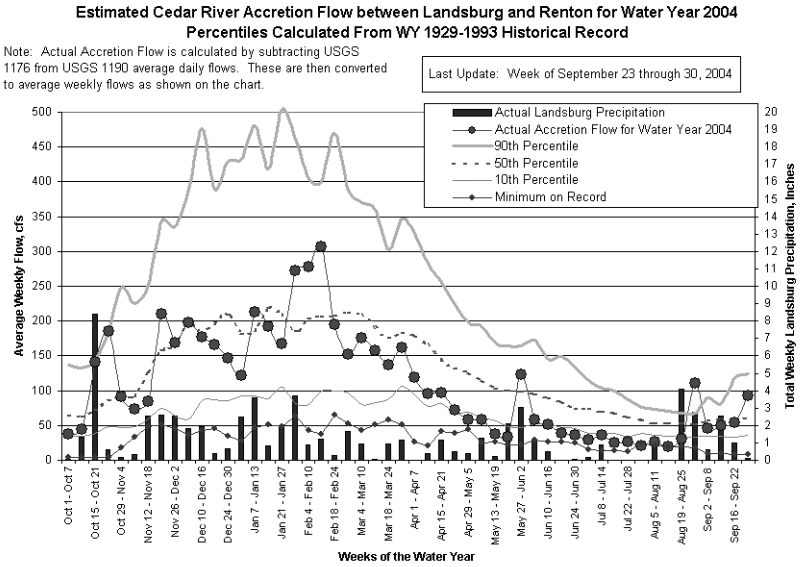


Figure 1. Draft conceptual monitoring and tracking graph for estimating lower Cedar River accretion flow between Landsburg and Renton.

To provide additional field data to help meet other specified study needs and objectives that might be established by the IFC during the study design phase, HCP cost commitments allow for up to three additional temporary stream gages to be strategically installed in the Lower Cedar River between Landsburg dam and Renton. In 2004, the IFC expressed their desire to involve the USGS on various potential phases of this accretion flow study. The USGS was contacted and they indicated that they have researchers who are interested and available to work on this project.

The IFC approved initial work activities in 2004 that would help the IFC make informed decisions to develop the detailed study scope of work. This included a request for an accretion flow dataset for the recent period WY 1994 to WY 2003 to be developed using the existing USGS stream gaging network data. The IFC would then review this dataset and compare it with the existing WY 1929 to WY 1993 accretion flow dataset. Development of this dataset is still in progress. Another work activity included the IFC looking at flow data from existing King County stream gages in the tributaries in the lower Cedar Basin. King County staff provided the tributary flow data for the IFC to review.

Looking Ahead (Planned 2005 Accomplishments)

The IFC will continue to work on developing a detailed 10-year Accretion Flow Study plan to implement within the resources available. The Switching Criteria Study is expected to begin in 2005. Existing gages will be operated and maintained continuously throughout 2005 to monitor compliance with elevations and flow and downramping rate requirements.

Financial Summary

During HCP Year 4, Seattle Public Utilities and Seattle City Light made cost commitment expenditures for three stream gages. For the existing stream gage above the Cedar Falls Powerhouse, the existing stream gage below the Cedar Falls Powerhouse and the existing stream gage below Landsburg, the City spent $48,820 for gage operations and maintenance to monitoring instream flow and downramping requirements.

For the following activities, there were no cost commitment expenditures made: (see Financial Monitoring Report Comments column for details)

- Temporary Gages in Lower River
- New gage at Renton
- Switching Criteria Study

A total of $8,750 was expended toward the HCP cost commitment for the Accretion Flow Study.

HCP Program Element: Cedar Permanent Dead Storage Project Evaluation
HCP Program Category: Instream Flow Monitoring and Research

Contact: Daniel Basketfield, Sr. Water Resources Engineer, Water Management Section; Dwayne Paige, Senior Watershed Ecologist, Watershed Management Division

Objectives and Goals

Water stored below the existing outlet of Chester Morse Lake is known as "dead storage". Currently, this significant amount of water can be accessed only by operating the Morse Lake Temporary Pumping Plants, and is permitted only during water shortage emergencies and under other very limited situations. In the context of the Cedar River Instream Flow Agreement, Seattle Public Utilities (SPU) has committed to evaluate use of dead storage to provide additional water for both instream uses and municipal and industrial water supply.

The reservoir currently supports healthy populations of fish and wildlife, including bull trout, which have been listed as threatened under the Endangered Species Act, and approximately one quarter of the breeding loon population in Washington State. Increased frequency and/or deeper reservoir drawdown may prevent bull trout upstream spawning migrations and impair loon nesting during some years. Project elements would include environmental studies, engineering and water rights evaluations, cost estimates, yield analyses, negotiations over instream flow augmentation, and other studies. The environmental impact and mitigation study would include literature search and model effects of increased reservoir drawdown on fish, wildlife, and wetland vegetation over a three-year period. If lower than usual drawdown occurs during the study period, effects on biota would be directly observed.

Status of Work (2004)

In early 2002, at the recommendation of the IFC, The Parties to the IFA approved the *first amendment to the IFA*. The amendment extended by five years the overall schedule for completion of the full suite of dead storage-related studies. It was agreed that certain aspects of the environmental evaluation that were proposed should proceed at the original schedule. These relate to impacts of reservoir drawdown on resident species and plant communities. These studies are relevant even without the development of permanent dead storage since low reservoir conditions may occur whenever there is a period of severe drought.

The Bull Trout Spawning Impedance (C100057) component was scoped and work initiated in 2004 that included (1) hydraulic and hydrologic studies concerning the magnitude and timing of Cedar and Rex river inflows across the delta fans and into the reservoir, and (2) the near completion of hydrographic surveys of the Cedar and Rex river deltas.
On a related project, SPU also looked into the reliability of the existing temporary pumping plant system at Chester Morse Lake, work which is of direct utility to our permanent dead storage project.

Looking ahead: Planned 2005 accomplishments

The IFAcalls for commencement of scoping for five environmental components of the Cedar Permanent Dead Storage Project. These components are:

- Dead Storage Study Engineering Assessment;
- Bull Trout Passage Assistance Plan;
- Pygmy Whitefish/Rainbow Trout Studies;
- Delta Plant Community Monitoring; and,
- Assessment of Common Loon Nesting Habitat

Of these, as noted above, the Bull Trout Spawning Impedance component was scoped and work initiated in 2004. In 2005 this project's management anticipates the selection of a contractor to perform the analysis and modeling of the Cedar and Rex river delta structures, with a draft final report to be available late 2005 or early 2006.

Financial Summary:

The recently approved amendment to the IFA delayed the start of cost commitments on this project.

Expenditures toward HCP cost commitments in 2004 (for the Bull Trout Spawning Impedance Study) were $ 67,688.

HCP Program Element: Improvements to the Cedar Falls Powerhouse and Masonry Dam
HCP Program Category: Instream Flow Management

Contact: Liz Ablow, Senior Fisheries Biologist; Pat Steele, Project Manager, Seattle City Light

Objectives and Goals

As part of the City of Seattle's HCP, Seattle City Light has been making changes at the Masonry Dam and the Cedar Falls Powerhouse to improve fish habitat within the Seattle's municipal watershed. These are important components of the HCP, as downstream improvements at Landsburg has allowed migrating anadromous salmonids access to this reach of the Cedar River for the first time in nearly 100 years.

Status of Work (2004)

1) Cedar Falls Tailrace Barrier
A tailrace barrier was installed at the Cedar Falls Powerhouse in 2002 to prevent injury to adult salmon and steelhead when anadromous fish passage occurred in 2003 above Landsburg. HCP year-4 accomplishments include:
- Baffles to dissipate energy during flow events were installed and tested.
- Tailrace barrier monitoring continues.

2) Cedar Falls Flow Modification
Modifications to the Masonry Dam are required to provide a continuous minimum river flow of 30 cfs in the canyon reach (between lower Cedar Falls and the Powerhouse) and to improve the control system for downramping. These changes include the installation of a new low-level valve in Masonry Dam. HCP year-4 accomplishments include:
- Installed and calibrated a flow meter that measures the combined flow of the new 18" inch low-level valve and the 48" Howell-Bunger Valve from the dam in early 2004.
- Implemented remote control of both Masonry dam valves that control flows downstream. The control points include the Cedar Fall Powerhouse and the System Control Center located in Seattle.
- Successfully planned, implemented and tested an automatic downramp capability for the Howell-Bunger valve in Masonry Dam at varying flows and downramp rates in 2004.

3) Cedar Fall Emergency Bypass Improvements
This Project will install mechanical devices and electronic controls on the bypass valves in the powerhouse to maintain and regulate flow in the event of a load rejection or load reduction. This will protect against stranding of fish and dewatering of redds as a result of such events. HCP Year 4 accomplishments include:
- Continued monitoring and fine-tuning of equipment.
- Completed improvements to the control system operator interface. This has improved the operators' ability to more easily respond to events that could cause flow disruptions in the river.

4) Installation of USGS gage
Installation of a new USGS gage upstream of the Cedar Falls Powerhouse is required to monitor the flow for compliance purposes once fish passage above Landsburg occurs. Accomplishments in HCP Year 4 include:
- Rating curve is continuing to be expanded.

Looking Ahead (Planned 2005 Accomplishments)

Most of the project construction was completed by the end of 2004. In the Masonry dam the new low-level valve now has remote operation capabilities, but -automatic flow controls for this valve is still planned. Overall, the bypass reach downramping system facilities and prescriptions are 95 % complete, but more time is needed to test the completed range of the automated down-ramping system once the low-level valve work is completed.

Financial Summary

The cost commitment for the Emergency Bypass project totaled $385,000; expenditures for the Emergency Bypass project totaled $134,634 in 2004, which combined with previous expenditures totals $3,953,407 (100 % of life-to-date expenditures). The total expenditure was substantially higher then the financial commitment due to a decision made by the City to develop a more reliable emergency bypass system than was called for in the agreement. For the tailrace barrier, expenditures were originally planned to occur in HCP Year 3 but the project was accelerated to ensure that it would be completed prior to fish passage at Landsburg planned for early fall 2003. The cost commitment for the tailrace barrier totaled $295,000; actual expenditures for HCP year-4 equaled $9,289, which combined with previous expenditures totals $ 1,955,523 (100 % of life-to-date expenditures). See Program Element Summary under Streamflow Gaging and Technical/Engineering Studies for financial information on the new stream gage above the Cedar Falls Powerhouse.

HCP Program Element: Conservation Messages for Fish
HCP Program Category: Instream Flow Management

Contact: Rich Gustav, Resource Conservation Division

Objectives and Goals

The goal of HCP marketing efforts is to educate consumers about the importance of their personal water use to our region's salmon habitat. Teaching our customers to use less water enables us to keep more water in the river for fish. Such conservation efforts are being carried out under SPU's "One Percent Conservation Initiative".

The goal of One Percent is to reduce personal and business water consumption one percent every year over a 10-year period with the end result being an overall reduction in water use of ten percent. Such conservation efforts could save approximately 14 million gallons of drinking water per day. Such an amount is equivalent to the projected population growth for King County over the next ten years. Keeping water demands lower reduces the demands on water supply by reducing the need for diverting water from instream flows. Conserving water is critical part of our commitment to wise management of natural resources.

Status of Work (2004)
There were a number of public outreach vehicles for distributing salmon related messages. The table below describes the vehicles and messages.

Product	*Type of Promotion*	*General Message*	*Target Audience*	*Size of Distribution*	*Cost*
Overwater -ing Wastes Resources	Radio, Print and Metro Bus signs	"Sprinklers can waist 35–50 percent of your water. Without knowing it you may be watering too much to often – which hurts your plants, wallet and the environment." The image shows water and salmon running into a storm drain	All home owners and business that water lawns and landscaping	1.6 million	$150,000
Waterbust-ers interactive online game.	TV Ad	Promoting new interactive game that allows players to move Bert the Salmon through a home and locating all the places where you can save water. Players race against the clock.	Families and kids.	100,000 Shown on KCPQ and WB 22	$10,000
Issaquah Salmon Days Booth	Event promotion	Conserving water is important to our water supply and fish.	Regional Saving Water Partnership customers	250,000 visitors	$2,000
Water Busters Game	On-line educational game	A race against the clock to help Bert the Salmon and his friends find all the ways to save water in the home so there is more water available for fish.	Families and kids	Available to everyone with internet access.	$1,000

Product	*Type of*	*General Message*	*Target*	*Size of*	*Cost*
Water Supply Interactive Map	Online Interactive map of our regional water supply.	Educates our customers on where their water comes from and how it reaches their homes. This map shows the relationship between fish and drinking water	Families and school aged children, ages 8 - 13	Online to all regional customers	$2,000
Water Supply Poster	Map of our regional water supply.	Educates our customers on where their water comes from and how it reaches their homes. This map shows the relationship between fish and drinking water	Families and school aged children, ages 8 - 13	500 posters	$1,500
Northwest Natural Yard Days	Spring and Fall Events	A series of events to promote the importance of natural yard care for the protection of our fish bearing streams and creeks.	Home owners with yards in Seattle and King County	All Saving-water Partnership customers	$200,000
The "Naturals" brochure series	Booklets – covering environmentally friendly yard care.	"Smart Watering," "Healthy Soil," "Natural Lawn," "Right Plant," "Compost at Home" and "Natural Pest," all help to educate serious gardeners on landscape practices that reduce water use and eliminate the need for chemicals that can run off and effect our streams and salmon runs.	Hotlines, nurseries, purveyors, The Northwest Flower and Garden Show, and other partners such as King County.	44,720	$44,720
Water Smart Technology	Booklet for businesses	Saving water can help reduce business expenses and leave more water available for fish and other wildlife.	All non-residential SPU and purveyor customers	300	$30
				TOTAL	$411,250

Looking ahead to 2005

An especially dry snow-free winter has raised concerns for water supplies across our region. Should dry weather persist, SPU is preparing an integrated water conservation campaign that encourages customers to reduce water use above our One Percent target. A coordinated campaign would interweave our on-going messages and rebate programs with the water supply issues related to drought conditions. Should normal rainfall return and water supply concerns vanish our planned messages would be geared toward the following customers:

- Residential customers who heavily water lawns and landscaping
- Customers who have Automatic irrigation systems
- Commercial customers who could benefit from installing water efficient products
- Customers interested in rebates for Washers and ET Controllers for automatic irrigation systems.

HCP Program Element: Locks Improvements - Smolt Passage Improvements and Freshwater Conservation
HCP Program Category: Instream Flow Management

Contact: Melinda Jones, Strategic Advisor, Resource Planning Division

Objectives and Goals

One of the objectives of the instream flow management component of the HCP is to help support measures that will contribute to improving downstream migration conditions for juvenile salmonids at the Hiram M. Chittenden Locks. The Smolt Passage Improvements project commits funding for smolt passage improvements at the Locks in co-sponsorship with King County and the Muckleshoot Indian Tribe. The Freshwater Conservation project commits funding for a feasibility study and implementation of cost-effective long-term water efficiency improvements at the Locks, with the aim of providing improved fish passage conditions.

Status of Work (2004)

The City continued to provide some funding and sponsorship for the joint Corps/City/County Lake Washington Ecosystem Restoration General Investigation Study. Work performed in 2004 included a Smolt Flume Observer Counting Efficiencies Study and a Relative Smolt Flume Efficiency Study; technical field research focused on juvenile salmon migration and habitat in the basin, regular monitoring and periodic refinement of the operation of the four smolt flumes at the Locks spillway dam; and review of pilot water quantity and water quality modeling efforts.

Looking Ahead (Planned 2005 Accomplishments)

Work planned for 2005 includes a formal review and synthesis of all studies and research work performed to date, identification and prioritization of remaining critical questions and information needs, and continued PIT tagging of juvenile salmon. Federal funding cuts have delayed rescoping and subsequent completion of the joint General Investigation Study, and completion may not occur until 2008 or later.

Financial Summary

There is no HCP commitment for funding in HCP year 4. Modest expenditures were planned for 2004 and beyond to help support work described above; $16,452 was spent in 2004 for Smolt Passage Improvements and $12,703 was spent in 2004 for Freshwater Conservation.

HCP Program Element: Cedar River Downstream Habitat Protection and Restoration Program
HCP Program Category: Landsburg Mitigation and Instream Flow Management

Contact: Cyndy Holtz, HCP Program Manager, Resource Planning Division

Objectives and Goals

Protection and restoration of salmonids and their habitat is vital to successful long-term recovery in the Lake Washington Basin. The goal of this program is to protect and restore fish habitat in the lower Cedar River downstream of the City's ownership boundary. Projects will be designed in a manner that will benefit any or all anadromous salmonid species, especially chinook salmon, and enhance natural ecological processes that shape and maintain riparian and aquatic habitat.

Status of Work (2004)

After lengthy negotiations with King County Department of Natural Resources, Cedar River Legacy program, to develop a legal agreement for cost-sharing land acquisitions in the lower Cedar River, the City and County were unable to reach a final agreement. At issue was the cost of ongoing land management and maintenance.

Alternatives to King County land ownership were then explored, including ongoing City ownership and land management, and land trust ownership and management. Because of the City's desire to limit its ongoing land management responsibilities on acquired lands, discussions were initiated with Cascade Land Conservancy (CLC), a prominent land trust in the Puget Sound region. Cascade expressed strong interest in collaborating with the City to provide support in the acquisition of lands, and in the ongoing management and stewardship of acquired lands. Continued discussions with CLC has resulted in development of an agreement whereby:

- CLC will facilitate the land acquisition process
- the City will take title to the properties
- the City will grant CLC a conservation easement on the land to ensure the land is protected in perpetuity, and
- CLC will provide ongoing stewardship and maintenance services.

The costs of the ongoing stewardship and maintenance will be paid for by the establishment of an endowment funded from this project's capital budget. The endowment will be placed in interest-earning accounts, to be managed by a trustee. Annual interest earned on the endowment will go to reimburse CLC for their stewardship and maintenance costs on the habitat lands.

During 2004 SPU and King County Cedar River Legacy program staff also collaborated on a second grant proposal to the U.S. Fish and Wildlife Service under the Cooperative Endangered Species Conservation Fund program. In 2002 the City and County were awarded $1.5 million of the $3 million total funding requested. This last year, the County and City were awarded an additional $1 million, bringing the total amount of grant funding under this program to $2.5 million. Originally, the City and King County intended to share in contributing the required matching funds for both of these grants. However, since the City and County will not be jointly acquiring lands, King County has agreed to provide the entire required matching funds, approximately $3.27 million. The City will submit a third funding proposal for the 2005 funding cycle for an additional $3 million. Results should be announced in the fall, 2005.

Looking Ahead (Planned 2005 Accomplishments)

By the end of the second quarter, 2005 the legal agreement and related conservation easement drafts with Cascade Land Conservancy will be finalized and approved by legislative actions of the Seattle City Council. Acquisition efforts will begin in the third quarter.

Financial Summary

The HCP provides funding for this program in two areas: Instream Flows ($3.55 million) and Landsburg Mitigation ($1.96 million), for a total of $5.51 million. There were no cost commitments expenditures during Year 4. However, there were non-cost commitment expenditures totaling $10,850 for staff time on agreement negotiations, program ownership and management alternatives research, and grant preparation.

HCP Program Element: Walsh Lake Restoration
HCP Program Category: Downstream Habitat Protection and Restoration

Contact: Brent Lackey, Watershed Management Division, Watershed Planner

Objectives and Goals

This program element is a part of a suite of projects intended to protect and restore aquatic, riparian, and floodplain habitat in the lower Cedar River, focusing on areas outside the drainage basin for the Landsburg Diversion on the Cedar River. For water quality reasons related to human habitation in the area, the drainage from Walsh Lake (within the municipal watershed) was rerouted in the 1930s from Rock Creek, which enters the Cedar River above Landsburg, to the newly constructed Walsh Lake Ditch, which enters the Cedar River below Landsburg. The Walsh Lake Restoration Project focuses on restoration in the Walsh Lake system and connecting areas. Cost commitment funds can be expended only if King County agrees to contribute an equal amount of for the restoration of this system.

Watershed staff identified a project to restore the original hydrological relationship between Walsh Lake and Rock Creek as potentially the best use of the funding for this program element. Such a project could have significant benefits. It would increase flows in lower Rock Creek, potentially improving habitat value for Chinook and steelhead. It would allow adult coho salmon better access to the tributaries to Walsh Lake for spawning and juveniles access to the excellent rearing habitat in these tributaries and the Walsh Lake wetland complex. The project could, however, also have unacceptable impacts to drinking water quality, could encounter legal constraints, and could have a variety of less desirable environmental impacts. To evaluate the feasibility of the foregoing option from legal, water quality, and environmental perspectives, staff initiated a "fatal flaw analysis." The purpose of that analysis is to conduct biological, hydrologic, water quality, and legal fatal flaw analyses of the potential restoration of Walsh Lake Ditch flows to Rock Creek in the lower Cedar River Municipal Watershed. Using SPU staff and technical consultants, we will monitor hydrology and water quality of the ditch and Rock Creek, and prepare a legal analysis regarding the downstream impacts of potential ditch abandonment and de-watering.

Status of Work (2004)

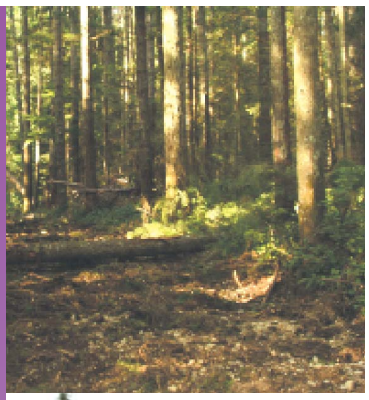
In 3rd and 4th Quarters 2004, hydrologic and water-quality monitoring equipment was purchased and installed, and hydrologic monitoring and data collection began. The project manager and Watershed staff worked with Water Quality staff to define the scope of water quality analysis and criteria for fatal flaws. Legal review and analysis was initiated. Staff in the Watershed Management Division and Water Quality Lab collaborated in the development of a water-quality study plan.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, hydrologic monitoring will continue at multiple flow gauging stations on Rock Creek and Walsh Ditch, and water quality sampling and analysis will be conducted using both SPU staff and technical consultants under contract, for both storm flows and base flows. The legal analysis should be completed in 2005 as well. Most of the analysis phase of the fatal flaw study should be completed by early 2006, and the assessment of potential restoration can then lead to definition of alternatives for action in 2007.

Financial Summary

No HCP cost commitment funds were expended in 2004. Funds from the BPA mitigation agreement were used to perform much of the work on this project, which included staff contract management, consultant support, and preparation of the water-quality element of the broader Quality Assurance Project Plan for the fatal flaw study. These activities are described under the BPA aquatic/riparian program described separately as an element of the report in this document on the BPA mitigation program.



BPA Mitigation

City of Seattle

Seattle Public Utilities & Seattle City Light

BPA Mitigation Program Background

The Bonneville Power Administration (BPA) Mitigation Program was the result of a Settlement Agreement reached between BPA and the City of Seattle that allowed BPA to construct the Schultz-Echo-Lake 500kV Transmission Line through the Cedar River Municipal Watershed in 2003 (City of Seattle Ordinance 121212). That Settlement Agreement specified that the City shall report annually on the use of the mitigation funds and provide prior notice to BPA on the anticipated use of those funds in the future. The Settlement Agreement indicated that such reporting shall be by means of descriptions included in the Annual Report of the City's Habitat Conservation Plan (HCP) implementation effort. This 2004 HCP Annual Report includes the first year of reporting for the BPA Mitigation Program.

The Settlement Agreement provided $6 million to the City's Water Fund, approximately $640,000 from the sale of timber from the new right of way, and transfer of three properties to the City (approximately 563 acres, referred to as the "Acquired Properties"). The Agreement specified that funds be used in the Seattle municipal watershed to generally accelerate, expand, and/or enhance activities in four categories of BPA's project-related impacts: Aquatic and riparian habitats, roads, security, and upland forests.

Program Development

In 2004, SPU started work on a wide range of activities described in this report. A major focus was to scope, schedule and budget work for the BPA Mitigation Program and to plan and develop and implement 2004 projects. Initial projects were for assessments and improvements to the newly acquired properties and to develop information systems that will facilitate work in 2005 and beyond. An emphasis for use of the BPA Mitigation Program funds is for on-the-ground improvements. In order to meet this goal, 2004 funds were also used for up front planning and information management system development.

An SPU management advisory group (MAG) was assembled to oversee the BPA Mitigation Program. The MAG is comprised of various SPU leads and directors. The MAG developed a spending plan to identify work task elements and their associated budgets, and for implementation of the spending plan. In developing the spending plan, a set of Guiding Principles were developed that require specific program projects and activities to:

- Be consistent with the BPA Settlement Agreement and City Council Ordinance (i.e., work falls in four stipulated categories and is physically located within the Cedar River Municipal Watershed);
- Address existing funding gaps in the HCP and Watershed Security Program for protection and restoration of the Watershed, by supplementing (not supplanting) committed funding in the 2003/04 budget;
- Assure a strong spatial and/or functional relationship to the impacts of BPA's construction project; Obtain the biggest "bang for the buck" and provide ability to leverage funds within SPU and with other entities;
- Address needed cleanup and security issues on newly acquired properties in power line right-of-way and, within the Lower Watershed, fund long term operations/maintenance needs created by capital expenditures.

The MAG also assembled a Stakeholders' Committee to assist in the review and development of the spending plan. The Committee included David Atcheson (Biodiversity Northwest), Dr. Jerry Franklin (UW College of Forest Resources), Dr. Tom Quinn (UW Fisheries and Aquatic Sciences Department), Joel Sisolak (Friends of the Cedar River Watershed), Charlie Raines (Sierra Club), Brian McKain (SPU Water System Advisory Committee), and Norm Winn (The Mountaineers). *Do we add more here?*

The following program development elements were developed using stakeholder input, the Guiding Principles, and guidance from the SPU Executives.

Aquatic/Riparian
- Invasive alien plant species planning and management
- Rock Creek large woody debris
- Restoration analysis for Walsh and Taylor ditches
- Aquatic/riparian restoration on Acquired Properties
- Fish recolonization research and monitoring related to the Landsburg fish passage program
- Helicopter support for large woody debris placement
- Large woody debris inventory and plan for the mainstem Cedar above Landsburg Dam
- Long term stream monitoring (accelerated benthic invertebrate studies, flow gage installation, water quality monitoring, etc.)
- Characterization of riparian habitats for prioritizing restoration
- Information management system for aquatic/riparian habitats and species

Roads
- Accelerated road decommissioning and improvements
- Decommissioning of targeted roads through or near streams and wetlands
- Road decommissioning and improvement on Acquired Properties
- Road monitoring
- Road decommissioning on Mt. Washington
- Information management system for the road network

Security
- Acquired Properties – fencing, gates, and cleanup on Acquired Properties
- New electronic gates to control access
- Improvements to existing gates
- Long term maintenance of new/improved gates
- Watershed communication enhancements
- Risk assessment for wildland fires
- Information management system for watershed access

Upland Forest
- Upland forest restoration projects – accelerated thinning near the BPA right-of-way and elsewhere in •
- Lower Watershed, within an adaptive management context
- Forest thinning on Mt. Washington
- BPA right-of-way restoration
- Upland restoration on Acquired Properties
- Planning, modeling, analysis to develop targets for restoration
- Characterization of upland forest habitats for prioritizing restoration
- Biodiversity program and adaptive management
- Information management system for forest habitats and species

Program Administration

SPU and the MAG are managing the BPA Mitigation Program using a "specifier/provider" model that adds rigor to project scopes of work and lines of responsibilities in the Program. This enables better performance and outcome of work products from the BPA Mitigation Program. A significant effort in 2004 involved identifying and formalizing the Program's "specifiers" and "providers" and their administration needs and protocols. Currently, SPU's Linda De Boldt (Resource Planning Division, Resource Management Branch) is the Program lead and Gail Arnold Coburn is the Program Specifier. Numerous providers have been identified in SPU depending on the nature of the specific projects. Generally, each specific project or body of related activity must have a Service Agreement with clearly identified rationale, scope of work, budget, and schedule. Each Service Agreement is then reviewed internally and

approved by the appropriate lines of managers. Work on a project may start only after the Service Agreement has been formally approved. An information management system was also developed to support planning and tracking costs for the BPA Mitigation and HCP programs.

Organization of this Report

The organization of the rest of this report consists of describing specific projects by major category, aquatic and riparian, roads, security and upland forest. Much work in 2004 was done on the newly acquired properties and work on these properties covered multiple categories. The acquired properties work is described first.

BPA Project: HCP / BPA Compliance Information Management System (HIMS)
BPA Program Category: All

Contact: Gail Arnold Coburn, Resource Planning Division

Objectives, Goals, and Scope

The objectives of the HCP / BPA Compliance Information Management System (HIMS) are:
To create an information management system which tracks program legal commitments (financial and performance), actual expenditures, actual work performed, un-met cost commitments, and records changes and noteworthy events in implementation
To create reporting capability for both automatic generation of annual reports, as well as ad hoc reporting functionality
To develop the ability to produce an HCP and BPA implementation timeline (with performance commitments and actual costs)

In order to achieve project goals, an information management system is being designed and built that integrates CIP project and O&M activity information for all efforts related to the HCP and BPA. This information will be extracted from SPU databases or entered manually by the HCP/BPA Program Managers or individual Project Managers.

Each year, the system will apply the new inflation factor annually to the current year and all remaining future years of the HCP. Formal reports are being designed to generate the annual Accomplishment Report mandated by our HCP and BPA commitments. Ad hoc reporting capability will be designed to allow program and project managers to track performance measures and actual spending to HCP and BPA commitments.

Status of Work (2004)

In 2004, all online screens were designed, built, and tested. All reports were designed, and nearly half were built.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, the remaining reports will be built, the entire system will be tested, and all screens and reports will be moved into Production.

BPA Project: Cedar River Municipal Watershed, Selleck Property Restoration
BPA Program Category: Upland Forest and Security

Contact: Clayton Antieau, Senior Watershed Planner, Watershed Management Division

Objectives, Goals, and Scope

The 363-acre Selleck Property was deeded (via quit claim deed) to the City in 2004 as part of the BPA Settlement Agreement with the City for purposes of constructing the Kangley-Echo Lake 500 kV Transmission Line through the Municipal Watershed. This parcel was determined by the City to be critical to ensuring watershed security and protecting water quality. The parcel was roaded, clearcut, and platted into20-acre parcels by the previous landowner. The parcels were in the process of being sold immediately prior to this property being deeded to the City. A package of restoration work (to be conducted over 2004 and 2005) was identified to restore disturbed areas to native vegetation, restore wetland hydrology where that has been lost by road construction, manage established invasive plant species, and construct appropriate security infrastructure (blockades, fences, and decommissioned roads). The BPA Schultz-Raver right-of-way passes immediately south of the Selleck Property.

The Selleck Property has been a point of trespass and illegal dumping in the Cedar River Municipal Watershed and along the BPA right-of-way. Addressing access and security issues is expected to reduce problems and associated costs in the future. In addition, conducting forest restoration activities and site restoration actions now will allow the City to maximize the benefits of enhanced forest growth and development.

Status of Work (2004)

UPLAND FOREST RESTORATION
Past land management activities on the Selleck Property resulted in the clearcutting of second-growth forest vegetation and the regeneration of dense forest stands on most of the 363 acres. A portion of the young forest had been precommercially thinned by previous land managers, but maintained a high residual density of trees consistent with forest plantation management objectives. City staff assessed forest restoration needs and determined that restoration thinning was warranted to maintain tree growth and improve forest habitat over time. Implementing forest restoration actions now is expected to reduce long-term operation and maintenance costs, and increase the value of forest habitat. This scope of work included implementation of a restoration thinning plan based on the Watershed's current (Habitat Conservation Plan) approach to forest and biodiversity management, as wll as limited mechanical removal of an invasive alien plant species, Scots broom (*Cytisus scoparius*). In 2004, SPU Service Agreement 2004-20 provided for the thinning of the young forest stands covering most of the property; that thinning program was designed to move these forest stands from a traditional forest plantation (established by the previous owner) to a more biologically diverse condition. That thinning work was completed on or around December 31, 2004.

SECURITY
In anticipation of a scope of restoration work involving upland forest restoration, security, aquatic/riparian restoration, and road decommissioning, the property boundaries of the Selleck Property were instrument-surveyed and physically marked. Service Agreement 2004-16 provided for that property boundary survey, which completed on or around February 28, 2005.

Looking Ahead (Planned 2005 Accomplishments)

The remaining elements of the scope of work for property restoration are expected to be completed on or around the end of December 2005. The elements include the following items:

UPLAND FOREST
Revegetation or restoration planting is anticipated on approximately 5 miles (9 acres) of deconstructed roads and landings, about 0.5 ac of borrow site, and a small area associated with the recently decommissioned water supply for the nearby community of Selleck. All restored wetland and stream road crossings will be revegetated with appropriate native plants.

SECURITY
An estimated 8100 linear feet needs to be constructed and posted (on the west and south boundaries) and approximately 7300 linear feet needs to be demolished/de-posted (on the east and north boundaries). Scope includes additional hardening at the former west point-of-entry and closure of the south point-of-entry.

AQUATIC/RIPARIAN
Forest roads cross several streams and two wetland areas on the Selleck Property. All such stream and wetland crossings will be identified and restored to original grade and vegetation. A stream crossing on the 91 Road appears to have washed out catastrophically some years ago, and will require more intensive restoration to repair in-stream habitat and ensure protection of downstream features.

ROADS
Approximately 5 miles (9 acres) of forest roads and 0.5 acre of landings/borrow sites exist on the Selleck Property and adjacent lands in Section 24. All of these roads will be decommissioned. The Section 24 work represents an acceleration of HCP road decommissioning commitments.

BPA Project: Cedar River Municipal Watershed, Trillium Property Restoration
BPA Program Category: Security Category for 2004 only

Contact: Clayton Antieau, Senior Watershed Planner, Watershed Management Division

Objectives, Goals, and Scope

The 110.47-acre Trillium Property was deeded (via quit claim deed) to the City in 2004 as part of the BPA Settlement Agreement with the City for purposes of constructing the Kangley-Echo Lake 500 kV Transmission Line through the Municipal Watershed. Approximately 60 acres are covered with second- or third-growth coniferous forests. The remainder of the property has 10-year-old trees, and the property includes approximately 4.6 acres of wetlands and numerous small streams that form headwaters of the Raging River. BPA retained a 300 ft electrical transmission right-of-way easement on the Property for the two 500 kV electrical transmission lines.

A package of restoration work (to be conducted over 2004 and 2005) was identified to restore forest structural and biological diversity, restore disturbed areas to native vegetation, restore stream and wetland hydrology where that has been lost or modified by road construction, and construct appropriate security infrastructure (blockades, fences, and decommissioned roads). The Trillium Property has been a point of trespass in the Cedar River Municipal Watershed and along the BPA right-of-way. Addressing access and security issues is expected to reduce problems and associated costs in the future. In addition, conducting forest restoration activities and site restoration actions now will allow the City to maximize the benefits of enhanced forest growth and development.

Status of Work (2004)

SECURITY
In anticipation of a scope of restoration work involving upland forest restoration, security, aquatic/riparian restoration, and road decommissioning, the property boundaries of the Trillium Property were instrument-surveyed and physically marked. Service Agreement 2004-17 provided for that property boundary survey, which completed on or around February 28, 2005.

Looking Ahead (Planned 2005 Accomplishments)

The remaining elements of the scope of work for property restoration are expected to be completed on or around the end of December 2005. The elements include the following items:

UPLAND FOREST
Past land management activities on the Trillium Property resulted in the clearcutting of second-growth forest vegetation and the regeneration of dense forest stands on most of the 110 acres. A thinning program will be designed to move forest stands from a traditional forest plantation (established by the previous owner) to a more biologically and structurally diverse condition.

Revegetation or restoration planting is anticipated on approximately 1,800 ft (0.34 mile; 0.5 acre) of deconstructed roads and landings. All restored wetland and stream road crossings will be revegetated with appropriate native plants.

SECURITY
An estimated 6,300 linear feet needs to be constructed and posted (on the north and east boundaries) and approximately 4,200 linear feet needs to be demolished/de-posted (on the south and west boundaries). Scope includes the closure/hardening at two points-of-entry along the BPA right-of-way.

AQUATIC/RIPARIAN

Forest roads cross several streams on the Trillium Property. All such stream crossings will be identified and restored to original grade and vegetation.

ROADS

Approximately 1,800 ft (0.34 mile; 0.5 acre) of forest roads and associated landings exist on the Trillium property. All of these roads will be decommissioned.

BPA Project: Cedar River Municipal Watershed, Foothills Property Restoration
BPA Program Category: Upland Forest, Security, and Roads

Contact: Clayton Antieau, Senior Watershed Planner, Watershed Management Division

Objectives, Goals, and Scope

The 169-acre Foothills Property was acquired by the City in 1999/2000 in response to residential development occurring there. This acquisition was determined to be critical to ensuring watershed security and protecting water quality. Prior to that acquisition, development activities resulted in some asphalt roads, building pads, and underground utilities being installed. This package of project work demolished those improvements, restore disturbed areas to native vegetation, inventoried and managed established invasive alien plant species, thinned young forest stands that cover most of the site, and constructed appropriate security infrastructure (blockades, fences, and roads). The BPA Kangley- and Raver-Echo Lake right-of-way passes through the Foothills Property.

The Foothills Property has been a point of trespass and illegal dumping in the Cedar River Municipal Watershed and along the BPA right-of-way. Addressing access and security issues is expected to reduce problems and associated costs in the future. In addition, conducting forest restoration activities and site restoration actions now will allow the City to maximize the benefits of enhanced forest growth and development. This project is an acceleration of HCP road decommissioning commitments.

Status of Work (2004)

UPLAND FOREST
Past land development activities resulted in the clearcutting of forest vegetation and the infestation of invasive alien plant species. Assessing forest restoration needs and implementing forest restoration actions will reduce long-term operation and maintenance costs, eliminate possible safety and security hazards, and increase the function and value of habitat. More than 160 acres has forest vegetation less than 15 years old. This developing forest required restoration thinning, which was designed to move these young forest stands from a traditional forest plantation (established by prior land managers) to more biologically and structurally diverse forest habitat. Supplemental biodiversity planting was implemented via revegetation of the decommissioned roads and building pads described below.

Infestations of invasive alien plant species, including King County Class B listed Scots broom (*Cytisus scoparius*), tansy ragwort (Senecio jacobaea) (King County Class B), and King County "Weeds of Concern" [butterfly bush (*Buddlejia davidii*), blackberry (*Rubus armeniacus* and *R. laciniatus*), and Japanese knotweed (*Polygonum* spp.)] were inventoried. Limited management actions (hand- and mechanical-pulling) were directed to infestations of butterfly bush, tansy ragwort, and Scots broom.

SECURITY
Fencing is provided primarily to deter trespass onto the City of Seattle's municipal watershed lands from adjacent property and to delineate approximate property boundaries. The reason for deterring trespass is to maintain watershed security. The fencing design does not prohibit or inhibit wildlife movements or cause injury or death to animals that attempt to negotiate the fences. For this project, fences were either demolished, repaired, checked for repair, or installed. An estimated 2200 linear feet of fence was constructed and posted (on the east boundary), approximately 2600 was inspected/repaired (on the south and southeast boundaries), and approximately 7000 linear feet of internal fence was demolished/de-posted (on the west and north boundaries). An internal gate was also demolished.

ROADS
Existing roads and building pads existed on and adjacent to the Foothills Property. Some of these roads were perimeter roads but became interior roads and were no longer needed to provide watershed security. Other roads were associated with past land development activity and were determined to be surplus to City needs. The demolition and restoration of these roads and pads reduces long-term operation and maintenance costs, eliminate possible safety and security hazards, and increase the function and value of habitat. Demolition and restoration included approximately 3700 linear feet of asphalt road, 8500 linear feet of compacted earth and gravel road, and 3 acres of building pad. Due to a determined lack of need, the 50.2a Road and portions of 50.4 Road were also decommissioned. The 50.2a and 50/4 road work represents an acceleration of HCP road decommissioning commitments. In addition, approximately 100 feet of gravel service road was reconstructed at BPA Tower 77/1 after the previously existing asphalt surface was removed. This scope item included the development of a revegetation plan for all soil disturbed by road and pad abandonment/decommissioning (described above).

Looking Ahead (Planned 2005 Accomplishments)

Most of the above scope of work was completed on or around the end of December 2004. The remaining tasks are scheduled for completion as follows:

UPLAND FOREST: The restoration planting will occur before the end of March 2005.

SECURITY: The small amount of remaining fence line installation will be completed before the end of February 2005.

ROADS: All road decommissioning will be completed before the end of February 2005.

AQUATIC/RIPARIAN RESTORATION SUMMARY

In September 2003, Landsburg Dam was reopened to upstream fish passage after more than 100 years. Native fish, except sockeye, were allowed to pass. The aquatic and riparian studies conducted under the BPA Mitigation Program include evaluation of anadromous fish recolonization, which is part of a larger recolonization study conducted with multiple funding sources, including the Cedar HCP. The 2004 BPA study was to evaluate both anadromous fish spawning in the reopened areas above the dam and adult coho moving back downstream over the dam. The 2004 survey identified 20 redds above the dam from 22 Chinook females and 19 redds from 34 coho. It was found that 23 of 49 radio-tagged fish moved back down over the dam. The redd survey will be repeated in 2005. Aquatic/riparian work also consisted of placing large woody debris (LWD), along Rock Creek near Road 10, to improve the aquatic environment of the stream. BPA Mitigation Program funds were also used to supplement the HCP fatal flaws analysis of Walsh Lake Ditch reconnection. Any more studies in 2005 under this category?

BPA Project: Cedar River Recolonization Studies
Detection of downstream adult coho salmon passage at Landsburg Dam
Redd surveys of Chinook and Coho Salmon
BPA Program Category: Aquatic/riparian

Contact: David Chapin, Watershed Ecologist, Watershed Management Division

Objectives, Goals, and Scope

Fish passage facilities at the Landsburg Dam were completed in the fall of 2003 allowing all native fish species to pass the dam (sockeye are excluded for water quality reasons). The new fish passage facilities successfully reopened more than 12.5 miles of mainstem and 4.5 miles of tributary spawning and rearing habitat to anadromous fish for the first time in more than 100 years. The two projects reported here are components of a larger set of studies that are monitoring the effectiveness of the new facility and investigating how anadromous fish recolonize the newly available habitat in the Cedar River Watershed above Landsburg. The primary objectives of these studies are to:

- Characterize the recolonizing adults as they enter the watershed to spawn, with respect to species, size, and genetic identity;
- Determine where they spawn and the characteristics of their spawning sites;
- Determine the productivity of each recolonizing species in the watershed;
- Examine what controls the observed level of productivity; and
- Examine the effects recolonizing salmon populations have on existing aquatic communities and ecosystems.

These studies are collectively being planned to evaluate the success of recolonizing salmon and support a number of future decisions related to fish passage, river management, and watershed restoration.

Detection of downstream adult coho salmon passage at Landsburg Dam The objective of this project was to establish a telemetry station at the Landsburg Dam to complement an existing network of four telemetry stations in the watershed. These stations aid in tracking fish that are tagged with radio transmitters at Landsburg; the new station provides critical data on fish that pass back over the dam after entering the watershed.

Redd surveys of Chinook and Coho Salmon
The objectives of the redd surveys are to locate spawning locations of Chinook and coho salmon that enter the watershed above Landsburg. This information is a central piece of the recolonization investigation. Funds are provided to conduct spawning surveys by raft during the fall and winter spawning periods.

Status of Work (2004)

Detection of downstream adult coho salmon passage at Landsburg Dam
The telemetry receiver at Landsburg was purchased and installed in September 2004. It successfully tracked all tagged fish immediately after release. It also determined which tagged fish eventually passed back down through the dam and how long they spent in the watershed. A total of 23 out of 49 tagged fish were detected moving back down through the dam.

Redd surveys of Chinook and Coho Salmon
Redd surveys were conducted for both Chinook and coho salmon in 2004, which included five and two surveys for Chinook and coho redds, respectively.
20 Chinook redds were located from a total of 22 Chinook females that passed above Landsburg
19 coho redds were located from a total of 34 coho females that passed above Landsburg.

Looking Ahead (Planned 2005 Accomplishments)

The coho telemetry tracking will likely not be continued in 2005.
Redd surveys for both Chinook and coho spawning will continue in 2005.

BPA Project: Rock Creek at 10 Road LWD
BPA Program Category: Aquatic/riparian

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives, Goals, and Scope

In order to improve the aquatic environment along Rock Creek, near Road 10, large woody debris were placed in the stream using hand techniques.

Status of Work (2004*)*

The 2004 LWD project on Rock Creek consisted of placing 50 LWD pieces using a hand cable system, to move logs up to 24 inches in diameter and 32 to 40 feet in length, into a 500 ft reach 300, ft upstream of the Road 10 crossing. LWD pieces were also be placed in the floodplain to address channel migration issues and riparian restoration objectives. A combination of Douglas Fir and Western Hemlock logs, which blew down during the November 2003 windstorm, were relocated to staging sties along the project area. To minimize disturbance to riparian vegetation and floodplain features, wood was transported from staging areas along the Road 10.6 using primarily hand techniques. An Earth Corps crew, 3 Operations staff and 3 Ecosystems staff, completed the work in 2 weeks.

Looking Ahead (Planned 2005 Accomplishments)

No work is anticipated on this project in 2005

BPA Project: Walsh Lake Ditch Reconnection Technical & Legal Fatal Flaw Study Phase 1B
BPA Program Category: Aquatic/riparian

Contact: Brent Lackey, Watershed Planner

Objectives, Goals, and Scope

The background, objectives, and scope for this fatal flaw analysis are described under the summary report for the HCP program (Walsh Lake Restoration, C100058). BPA mitigation funds are used to supplement HCP efforts.

Status of Work (2004)

In the last half of 2004, hydrologic and water-quality monitoring equipment was purchased and installed, and hydrologic monitoring and data collection began. The scope of water quality analysis and criteria for the fatal flaws project was defined and legal review and analysis was initiated. Watershed Management Division and Water Quality Lab staff collaborated in the development of a water-quality study plan. BPA funds were used to cover the inventory and maintenance of existing monitoring equipment, and the acquisition of additional gauging technology. BPA funds also provided for consultant support to refine the plan for the study and install hydrologic and water quality sampling stations, complementing work conducted under the HCP program.

Looking Ahead (Planned 2005 Accomplishments)

In 2005, hydrologic monitoring will continue at multiple flow gauging stations on Rock Creek and Walsh Ditch, and water-quality sampling and analysis will be conducted using both SPU staff and technical consultants, for both storm flows and base flows. The legal analysis should be completed in 2005, as well. Most of the analysis phase of the fatal flaw study should be completed by early 2006, and the assessment of potential restoration can then lead to definition of alternatives for action in 2007.

ROAD RESTORATION/DECOMMISSIONING SUMMARY

The upper Cedar watershed includes bridges and over 600 miles of roads and 3,000 culverts. The BPA Mitigation Program is funding decommissioning or closure of unneeded roads in the upper Cedar watershed and improvements to existing roads, as needed. Projects conducted in 2004 consisted of assessments of three roads that have environmental concerns and development of a computer information system to enable better management of the roads. BPA and other funds will be provided in 2005 to refine the information management system. Additional work planned for 2005 includes finishing the roads decommissioning and improvements.

BPA Project: Decommission/Improvement of 33, 60, and 80 BPA Targeted Roads
BPA Program Category: Roads

Contact: Dave Beedle, Senior Watershed Hydrologist, Watershed Management Division

Objectives, Goals, and Scope

The 33, 60 and 80 roads are located through stream channels or wetlands, or are on stream banks, and cause a variety of impacts to aquatic habitat and water quality. The current configuration of these roads makes it extremely difficult, if not impossible, to meet current State of Washington regulations. The goal of the project is to hire a consultant to conduct environmental studies and complete decommissioning design and/or improvement design to achieve Washington Department of Natural Resources (WDNR) regulatory compliance and for improved water quality, reduced environmental impact, and reduced maintenance costs.

Status of Work (2004)

The consultant completed all required environmental studies and reports and complete draft decommissioning design and/or improvement design. The consultant also attended a pre-application meeting with State of Washington permitting agencies.

Looking Ahead (Planned 2005 Accomplishments)

Complete final decommissioning and/or improvement design. Complete decommissioning and/or improvement work on the 33, 60 and 80 roads.

SECURITY SUMMARY

Fires can be a problem in the watershed and an analysis of the risk and fire-management methods is needed to protect and maintain the Cedar watershed ecosystem and water supply. The BPA Mitigation Program funds were used in 2004 to conduct a fire assessment and management plan. In addition, funds were used to develop an information management system to improve safety and security of the watershed and safe staff time and funds for more on-the-ground work (true?). This system will be fully implemented in 2005. Vehicle laptops and mobile satellite telephones were purchased in 2004 to allow field staff increased personal and watershed safety and for immediate access to information and other personnel. This will greatly improve management of the security and ecological characteristics of the watershed. (true?) Vehicle installation of the laptops started in 2004 and will be completed and used in 2005, along with the satellite phones. In order to make the laptops more effective and accessible to information, a wireless network will be installed. A consultant was hired in 2004 and work will be completed in 2005.

BPA Project: Cedar River Municipal Watershed Fire Hazard Assessment and Options Analysis
BPA Program Category: Security

Contact: Darian Davis, Watershed Protection Supervisor, Watershed Management Division

Objectives, Goals, and Scope

Large forest fires in the municipal watershed would pose a serious risk to the water supply. With longer warm and dry seasons, and global warming, the risks of forest fires may be increasing. This project will yield a report that describes current forest fire hazards, predicts future changes in fire hazards, and identifies options for addressing and minimizing fire hazards in the Cedar River Municipal Watershed (CRMW). In addition, the project provides an overview of key suppression needs, including locations of water sources and helicopter landing pads. This information will be used to identify, plan, and prioritize watershed restoration projects, including forest restoration and road decommissioning.

Status of Work (2004)

In late 2004, consultants Dave Peterson and Morris Johnson of the USDA Forest Service PNW Fire Research Lab in Seattle were chosen to complete this project. On November 29, a kick-off meeting was held with consultants and SPU staff (Protection, Operations, and Ecosystems) to discuss initial concerns and to confirm the scope of the work.

Looking Ahead (Planned 2005 Accomplishments)

Much work will be accomplished in the first two months of 2005. This includes the consultant beginning to analyze on-hand forest data. In March, the consultant will present a draft of their initial analysis at a meeting for all interested staff. With the mild winter the consultant is also hoping to start in on some fieldwork early in the season. The entire project is scheduled to be completed by August 2005.

BPA Project: Watershed Protection Section laptop purchase and installation/ Cedar Watershed satellite phones for security and communications
BPA Program Category: Security

Contact: Darian Davis, Watershed Protection Supervisor, Watershed Management Division

Objectives, Goals, and Scope

Both the satellite phones and the laptops were purchased to improve remote communication for Watershed Protection Personnel. Specifically, the satellite phones address safety and security needs that the Protection Section desperately needed. The Laptops address information technology solutions to Protection personnel to collect, store, retrieve, and disseminate mission-critical information. Most importantly the laptops will enable Inspectors to check on access permits in the field so that they can address any trespass issues much more efficiently.

Status of Work (2004)

At the end of 2004 all of the satellite phones and laptops were purchased and delivered. This included the vehicle mounting hardware for both.

Looking Ahead (Planned 2005 Accomplishments)

In early 2005, the vehicle mounting brackets for the laptops will be installed in all of the Protection Section Vehicles. Once installed and the watershed staff oriented on their use, the laptops will go into service. Hand-held satellite phones will be issued to watershed protection staff for use when they're away from their vehicles.

UPLAND FOREST RESTORATION SUMMARY

Upland forest management and improvements to the watershed will be greatly enhanced through better and more detailed habitat characterization. As such, the use of light detection and ranging data evaluation (LiDAR) was initiated in 2004 and will be completed in 2005. Completion includes production of maps for forest management.

BPA Project: Habitat Characterization using Light Detection and Ranging (LiDAR) Data Evaluation and Exploitation
BPA Program Category: Upland Forest

Contact: Duncan Munro, IT Professional B, Watershed Management Division

Objectives, Goals, and Scope

The LiDAR Data Evaluation and Exploitation project is intended to meet the goals of Seattle Public Utilities, Watershed Management Division for assessing current habitat conditions in the Cedar River Municipal Watershed (CRMW). The project is divided into two phases. Phase 1, the evaluation phase, will determine the viability of LiDAR as a tool for estimating habitat conditions using specific locations where field observations have previously been collected. On successful completion of this work, a second phase, exploitation, is proposed that will design and implement methods to use LiDAR data to create maps of habitat conditions for each asset class within the CRMW.

Status of Work (2004)

Loaded digital ground model (DGM) data (i.e., a representation of the surface of the ground) to *wshed2* and combined (mosaiced) individual tiles to create seamless coverage for CRMW.

Loaded digital surface model (DSM) data (i.e., a representation of the surface of the forest canopy) that provides only partial coverage of CRMW. Major delays have been experienced in recieiving the remaining coverage from the King County GIS center.

Completed pilot study for hydrology group:
- Created a suite of topographic profiles in Rock Creek depicting channel gradient
- Created a suite of topographic transects across Rock Creek
- Estimated confinement using field observations compiled at Rock Creek
- Compiled training documentation for derivation of topographic profiles

Completed major parts of pilot study for forest ecology group:
- Derived estimates of tree height by subtraction of LiDAR DGM and DSM products
- Compared estimates of tree height with measurements made in the field and determined average error of 5% of maximum tree height
- Developed methods to derive estimates of stem density from LiDAR points files
- Compared estimates of stem density with measurements made in the field and determined average error of 14% of measured stem density
- Developed maps of tree height for that portion of the CRMW for which we have data
- Developed methods to calculate derivatives of tree height that repesent canopy gap distribution
- Develop methods to expand estimates of stem density to the landscape scale

Looking Ahead (Planned 2005 Accomplishments)

There is a great deal of uncertainty as to whether we can obtain the remaining DSM data products from King County. In the event that we can obtain the remaining data, and depending on the outcome of the pilot study, we will complete the following tasks

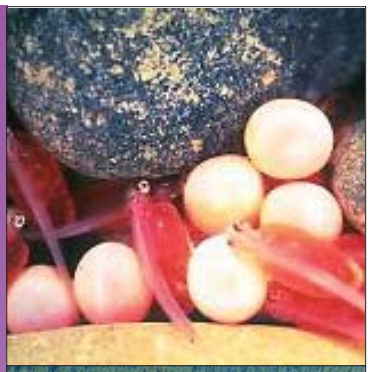
- Develop maps of tree height for the remainder of the CRMW
- Produce maps of stem density for remainder of the CRMW
- Test methods to estimate diameter at breast height (dbh) from measurements of tree height, stem density, slope, aspect and site index
- Produce maps of estimated diameter at breast height (dbh) for the CRMW

FINANCIAL SUMMARY

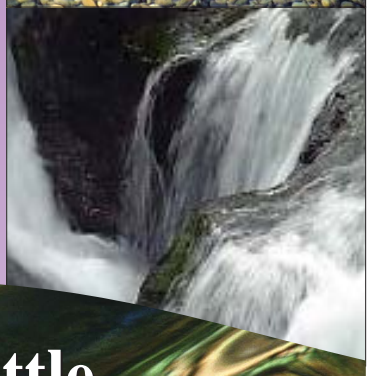
A summary of the spending plan budget and actual 2004 expenditures for the entire BPA Mitigation Program is presented below. Much work was accomplished in 2004, after approval to proceed was given mid-year.

BPA Mitigation Program Category*	**All Years Budget**	**Expended 2004**
CAPITAL IMPROVEMENT PROJECT (CIP)FUNDS		
Aquatic and Riparian Restoration	$1,493,000	$274,869
Road Restoration and Decommissioning	$1,274,000	$190,521
Security	$ 835,000	$279,588
Upland Forest Restoration	$ 942,000	$175,477
Total CIP	$4,544,000	$920,457
OPERATIONS AND MAINTENANCE (O&M)		
Resource Management and Watershed Management	$1,104,956	$ 23,165
Divisions		
Supplement Cedar River HCP	$ 991,044	0
	$2,096,00	$ 23,165
Total CIP and O&M	**$6,640,000**	$943,621

**Date from March 1, 2005 Pivot table for CIP budget and March 18 Pivot for O&M from Seattle Rainier Data Base*



Financial Overview



City of Seattle

Seattle Public Utilities & Seattle City Light

HCP YEAR 4 FINANCIAL MONITORING REPORT
(as of year-end 2004)

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WATERSHED MANAGEMENT									
Watershed Road Improvement and Decommissioning (cost category 1)									
1	Anderson, C	Watershed Road Decommissioning	$5,981,250	$1,435,752	$301,250	$395,532	$94,282	Average 10 miles of road decommissioned per year over 20 years. Fund $250,000 per year for the first 20 years, based on cost of $25,000 per mile for deconstruction.	Abandoned 9.1 miles of road network.
2	Anderson, C	Watershed Road Improvements	$8,675,000	$1,469,082	$421,750	$421,750	$0	Road repair and improvements, culvert replacement, fish passable stream-crossing structures, slope stabilization, construct new roads to reduce sediment loading to river and streams. Fund $1,750,000 over the first 5 years, based on cost of $2,000 per mile for stabilization and repair, and $600 for each additional installed cross drain. Average annual cost commitment in Years 1-5 is $385,000.	Completed road improvements on approximately 5 miles of the 200 Road; conducted work on development of a new road inventory system to support logistical planning and prioritization to increase efficiency.
3	Anderson, C	Watershed Road Maintenance	$3,921,560	$345,530	$112,790	$93,524	-$19,266	Provide an increased level of maintenance over levels previous to HCP implementation specifically for reducing sediment loading to streams. Fund $468,000 over the first 5 years. Average annual cost commitment in Years 1-5 is $102,960.	Accomplished 42 miles of road maintenance, focusing on grading and compacting road surfaces that could potentially impact aquatic habitat.
		SUBTOTALS	**$18,577,810**	**$3,250,364**	**$835,790**	**$910,806**	**$75,016**		
Stream and Riparian Restoration (cost category 1)									
4	Beedle, D	LWD Replacement in Streams	$1,172,690	$49,796	$15,060	$17,489	$2,429	Fund $100,000 over the first 8 years, based on estimated cost of $20,000 per project. Average annual cost commitment in Years 1-8 is $13,750.	Installed 50 LWD pieces on Rock Creek with the use of a hand cable system to move logs up to 24 inches in diameter and 32 to 40 feet in length into a 500-foot reach 300 feet upstream of the 10 Road crossing.
5	Beedle, D	Bank Stabilization	$907,520	$80,318	$23,800	$43,344	$19,544	Stabilize approximately 200 feet of stream bank per year averaged over the first 8 years. Fund $158,000 over the first 8 years, based on cost of $10,000 per 100 linear feet of stream bank. Average annual cost commitment in Years 1-8 is $21,730.	Moved approximately 300 feet of the 200 Road away from Rack Creek to allow for removal of eroding road fill, reestablishment of the floodplain and placement of LWD.
6	Beedle, D	Bank Revegetation	$254,300	$40,698	$7,980	$4,081	-$3,899	Revegetate approximately 330 linear feet of stream bank per year averaged over the first 8 years. Fund $53,000 over the first 8 years, based on cost of $2,000 per 100 linear feet of stream bank. Average annual cost commitment in Years 1-8 is $7,290.	Conducted planting of streamside areas in Seattle and Goat Sub-basins during fall 2004 to accelerate recovery of streambanks and associated riparian zones disturbed by road decommissioning work.
7	LaBarge, A	Riparian Conifer Underplanting	$254,360	$33,487	$7,530	$7,100	-$430	Reestablish conifers in riparian and streamside areas for approximately 20 acres per year averaged over the first 8 years. Fund $50,000 over the first 8 years, based on cost of $300 per acre planted. Average annual cost commitment in Years 1-8 is $6,880.	Completed a riparian planting project along Rock Creek in the lower Cedar River Watershed in conjunction with a LWD placement project. A variety of tree and shrub species were planted over 2.2 acres, effecting approximately 500 linear feet of riparian area.
8	LaBarge, A	Riparian Restoration Thinning	$215,910	$31,283	$6,780	$7,041	$261	Perform thinning on approximately 18 acres per year averaged over the first 8 years. Fund $45,000 over the first 8 years, based on cost of $316 per acre thinned. Average annual cost commitment in Years 1-8 is $6,190.	Conducted riparian restoration thinning on 37 acres along Seattle Creek and 8 acres along Troublesome Creek in the upper watershed in association with upland restoration thinning.

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9	Spencer, M	Stream Crossing Projects for Passage of Peak Flows	$1,021,510	$70,477	$18,830	$18,830	$0	Implement approximately 12 stream crossing projects to improve flow patterns per year averaged over the first 8 years. Fund $125,000 over the first 8 years, based on cost of $1,250 per culvert. Average annual cost commitment in Years 1-8 is $17,190.	Installed four 36" culverts on the 30 Road and replaced one culvert each on the 50 and 70 Roads. Completed design for the 2005 project to replace the crossing and Eagle Creek on the 100-300 Road.
10	Spencer, M	Stream Crossing Projects for Fish Passage	$1,449,100	$747,240	$144,600	$141,600	-$3,000	Implement approximately 4 stream crossing projects to reestablish fish passage per year averaged over the first 8 years. Fund $960,000 over the first 8 years, based on cost of $20,000 to $36,000 per culvert or structural improvement. Average annual cost commitment in Years 1-8 is $132,000.	Installed arch culvert crossing at Carey Creek tributary on 19 Road; completed design for Gear Creek tributary on 600 Road and purchased replacement bridge; copmleted plan to restore fish passage in Webster Creek at Taylor Ditch siphon.
		SUBTOTAL	**$5,275,390**	**$1,053,299**	**$224,580**	**$239,485**	**$14,905**		
Upland Reserve Forest Restoration (cost category 1)									
11	LaBarge, A	Upland Restoration Thinning	$3,121,790	$798,652	$243,110	$127,469	-$115,641	Conduct restoration thinning on approximately 800 acres per year averaged over the first 8 years. Fund $1,614,000 over the first 8 years, based on cost of $250 per acre thinned. Average annual cost commitment in Years 1-8 is $221,930.	Restoration thinned approximately 650 acres primarily in the upper watershed, which is dominated by the Pacific silver fir forest type. Effectiveness monitoring occurred in each of the treatment types to provide baseline data for future monitoring and adaptive management. Compliance monitoring was conducted concurrently with the thinning implementation.
12	LaBarge, A	Upland Ecological Thinning	$1,199,530	$86,105	$37,660	$2,166	-$35,494	Conduct ecological thinning on approximately 500 acres per year averaged over the first 8 years. Fund $250,000 over the first 8 years, based on a cost of $500 per acre thinned. Average annual cost commitment in Years 1-8 is $34,380.	Delivered for stakeholder review a draft plan for the 700 Road Forest Restoration Project, the second ecological thinning project proposed in the watershed. The plan outlined the ecological objectives and silvicultural prescriptions for the project area.
13	LaBarge, A	Upland Restoration Planting	$359,870	$19,227	$11,300	$0	-$11,300	Conduct restoration planting on approximately 31 acres per year averaged over the first 8 years. Fund $75,000 over the first 8 years, based on cost of $300 per acre planted. Average annual cost commitment in Years 1-8 is $10,310.	Plans for planting trees, shrubs, and non-traditional flora were being developed conjunction with the 700 Road Ecological Thinning project, originally scheduled to be implemented in 2004 but now scheduled for 2005.
		SUBTOTALS	**$4,681,190**	**$903,984**	**$292,070**	**$129,635**	**-$162,435**		
		WATERSHED MANAGEMENT TOTALS	**$28,534,390**	**$5,207,647**	**$1,352,440**	**$1,279,926**	**-$72,514**		
LANDSBURG MITIGATION									
Chinook, Coho and Steelhead Mitigation (cost category 3)									
14	Bachen, B	Interim Chinook, Coho and Steelhead Mitigation	$851,850	$220,230	$108,450	$92,071	-$16,379	Between Years 1 and 8, accomplish the following: i) fund the implementation of life history, genetic, demographic and/or ecological studies to fill critical information gaps; ii) implement emergency supplemental production programs designed to help sustain and rebuild populations; and/or iii) other measures deemed appropriate by Parties. Parties agree on form of interim mitigation within two years of initiating discussion (discussion period began 3/29/01).	Work focused on evaluation of recolonization by coho and Chinook salmon above Landsburg Dam; research on genetic relationships among resident and anadromous steelhead; and adult PIT tag detection at the Ballard Locks.
15	Wells, B	Landsburg Fish Passage *(see note at end)*	$7,490,840	$12,245,597	$680,840	$803,025	$122,185	Complete construction of Fish Passage facilities by the end of Year 3.	Project construction was completed on schedule and all facilities were operational by September 2003. 2004 expenditures were for final contractor payments and close-out.

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16	Little, R	Operation of Passage Facilities	$2,831,750	$189,522	$60,250	$97,882	$37,632	Provide up to $50,000 per year during term of LMA to operate and maintain fish passage facilities.	All elements of the project, intake screens, downstream passage gate, the fish ladder and associated fish sorting and transport facilities, were placed into operation in late summer of 2003, just prior to the return of adult salmon. 2004 marks the first full year of operations for the newly constructed facilities.
		SUBTOTALS	**$11,174,440**	**$12,655,349**	**$849,540**	**$992,978**	**$143,438**		
Sockeye Mitigation (cost category 4)									
17	Bachen, B	Interim Sockeye Mitigation	$1,202,560	$1,071,687	$308,480	$311,385	$2,905	Operate existing interim hatchery at Landsburg.	In 2004, the interim hatchery released 9.9 million fry. Fry production was impacted by difficulty in collecting broodstock due to high October flows that damaged the collection facility. No further losses to IHN virus occured this year.
18	Bachen, B	New Sockeye Hatchery - Design & Construction	$9,179,620	$1,510,594	$3,954,810	$297,753	-$3,657,057	Initiate design of replacement hatchery in Year 1. Parties agree in Year 3 as to design, capacity, operating guidelines, and adaptive management program. Hatchery facilities will be operational by Sept. 1 Year 5.	Work continued on the Supplemental EIS throughout 2004. Engineering design of the hatchery facilities was 90% complete by the end of 2004.
19	Bachen, B	Operation of Replacement Hatchery	$16,629,000	$0	$0	$0	$0	Provide up to $300,000 per year to operate and maintain the facilities for the term of the LMA. Commitment begins in HCP Year 5.	Commitment begins in Year 5. Completion of hatchery construction scheduled for 2007.
20	Bachen, B	Supplementation Guidelines	$35,200	$11,198	$0	$0	$0	The Parties, in consultation with the AFC, shall develop guidelines to govern the design, construction, operation and monitoring phases of the sockeye fry production program.	Guidelines completed in 2001.
21	Bachen, B	Broodstock Collection Solutions	$226,000	$110,495	$0	$0	$0	In Years 1 through 3, develop and evaluate measures to improve sockeye broodstock collection practices.	Work was performed on conceptual design of a replacement broodstock collection facility focusing on stream hydraulics, geomorphology, and efficiency of facility operations.
		SUBTOTALS	**$27,272,380**	**$2,703,974**	**$4,263,290**	**$609,138**	**-$3,654,152**		
Downstream Habitat (cost category 4)									
22	Holtz, C	Downstream Habitat - all species	$1,964,500	$17,022	$1,677,360	$0	-$1,677,360	Provide up to $1,637,000 in HCP Years 2 through 5 to acquire, restore, and/or protect habitat for any or all anadromous fish, especially chinook salmon, in the lower Cedar River outside the City's current property ownership boundary. HCP required implementation schedule is between Years 2 and 5.	Negotiations to develop a collaborative land acquisition and management agreement with King County were suspended. Promising negotiations with Cascade Land Conservancy whereby Cascade provides acquisition and ongoing land stewardship services.
		SUBTOTALS	**$1,964,500**	**$17,022**	**$1,677,360**	**$0**	**-$1,677,360**		
		LANDSBURG MITIGATION TOTALS	**$40,411,320**	**$15,376,345**	**$6,790,190**	**$1,602,116**	**-$5,188,074**		
INSTREAM FLOWS									
Powerhouse Improvements (cost category 2)									
23	Steele, P	Emergency Bypass	$385,000	$3,953,407	$0	$134,634	$134,634	Install new equipment to provide bypass flows around its hydroelectric turbines during most emergency plant shutdowns to protect against stranding of fish and dewatering of redds as a result of such events.	Continued monitoring and fine tuning of equipment occurred; completed improvements of the operator interface to the control system which improved operators' ability to better respond to events that could cause flow disruptions in the river. The life-to-date cost commitment expenditure amount has been adjusted to correct for inaccuracies in previous years' reports.

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24	Steele, P	Tailrace Rack	$295,000	$1,955,523	$0	$9,289	$9,289	Upon construction of fish ladder, install a tailrace rack at the Cedar Falls Powerhouse to protect fish from injury or mortality.	Installed and tested baffles to dissipate energy during flow events. The life-to-date cost commitment expenditure amount has been adjusted to correct for inaccuracies in previous years' reports.
		SUBTOTALS	**$680,000**	**$5,908,930**	**$0**	**$143,923**	**$143,923**		
Ballard Locks Improvements (cost category 2)									
25	Jones, M	Smolt Passage Improvements	$687,500	$596,050	$0	$16,452	$16,452	Commit up to $625,000 for smolt passage improvements at the Chittenden Locks in co-sponsorship with King County and the Muckleshoot Tribe.	Provided funding and sponsorship for the joint Corps/City/County Lake Washington Ecosystem Restoration GI Study. Work included Smolt Flume Observer Counting Efficiencies Study and Relative Smolt Flume Efficiency Study; research on juvenile salmon migration and habitat in the basin, regular monitoring and periodic refinement of operation of the four smolt flumes at the Locks spillway dam; and review of pilot water quantity and water quality modeling efforts.
26	Jones, M	Freshwater Conservation	$1,480,000	$213,248	$0	$12,703	$12,703	Commit to local sponsorship, up to $1,250,000, for the purposes of funding a feasibility study and implementation of long-term water efficiency improvements at the Chittenden Locks.	See comments above under Smolt Passage Improvements.
		SUBTOTALS	**$2,167,500**	**$809,298**	**$0**	**$29,155**	**$29,155**		
Conservation Messages for Fish (cost category 2)									
27	Gustav, R	Conservation Messages for Fish	$1,802,250	$731,785	$36,150	$411,250	$375,100	Publish or broadcast water conservation messages every summer that emphasize the importance of water conservation to protect fish habitat each year of the HCP.	Several salmon related water conservation public outreach messages, including TV ads, event promotion, booklets, brochures, and on-line games and maps were developed and distributed in Year 3. Costs exceeded the commitment amount because work was included within SPU's larger One Percent Conservation program.
		SUBTOTALS	**$1,802,250**	**$731,785**	**$36,150**	**$411,250**	**$375,100**		
Downstream Fish Habitat (cost category 2)									
28	Holtz, C	Downstream Habitat Protection and Restoration (Instream Flow)	$3,545,000	$72,415	$1,205,000	$0	-$1,205,000	Provide up to $3,000,000 to protect and restore aquatic riparian and floodplain habitat in the lower Cedar River downstream of the municipal watershed.	Negotiations to develop a collaborative land acquisition and management agreement with King County were suspended. Promising negotiations with Cascade Land Conservancy whereby Cascade provides acquisition and ongoing land stewardship services.
29	Lackey, B	Walsh Lake Restoration	$313,200	$0	$0	$0	$0	Provide up to $270,000 for restoration of the Walsh Lake system and connecting areas within the municipal watershed (to be matched by King County).	Hydrologic and water-quality monitoring equipment was purchased and installed, and hydrologic monitoring and data collection began.
		SUBTOTALS	**$3,858,200**	**$72,415**	**$1,205,000**	**$0**	**-$1,205,000**		
		INSTREAM FLOWS TOTALS	**$8,507,950**	**$7,522,428**	**$1,241,150**	**$584,328**	**-$656,822**		

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RESEARCH AND MONITORING									
Instream Flow Monitoring and Research (cost category 6)									
30	Chinn, A	Existing Stream Gage at Cedar Falls	$296,610	$40,207	$0	$12,262	$12,262	Measure downramping rates immediately below the powerhouse using existing gage at river mile 33.2.	Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period.
31	Chinn, A	Existing Stream Gages Below Landsburg	$657,220	$60,963	$13,180	$23,462	$10,282	Monitor flows and downramping rates with the existing gage at USGS station located below Landsburg at River Mile 20.4.	Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period.
32	Ablow, L	New Stream Gage Above Powerhouse	$632,630	$121,524	$0	$13,095	$13,095	Establish a new USGS stream gage near river mile 33.7 just upstream of the Cedar Falls hydroelectric facility tailrace to monitor compliance with the City's commitment to provide minimum rearing flows of 30 cfs for anadromous fish in the bypass reach between Lower Cedar Falls and the powerhouse once fish passage facilities are complete.	Installation of a new USGS gage upstream of the Cedar Falls Powerhouse is required to monitor the flow for compliance purposes once fish passage above Landsburg occurs. Rating curve is continuing to be expanded.
33	Chinn, A	New Gage at Renton	$142,020	$0	$10,970	$0	-$10,970	For the purpose of accretion flow monitoring study, monitor flows at existing stream gage at river mile 1.6. If a more suitable location is found near existing gage site, fund installation and temporary operation of a new USGS stream gage.	Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period.
34	Chinn, A	Temporary Gages in Lower River (2)	$152,800	$0	$12,050	$0	-$12,050	Monitor flow at up to two additional locations between Renton and Landsburg for a temporary period as part of the accretion flow study to help monitor accretion flows between Landsburg and Renton. Monitoring will begin when accretion flow study is initiated and will terminate when study is completed by or before Year 13.	Existing gages to monitor compliance with elevations and flow and downramping rate requirements were maintained continuously throughout this reporting period.
35	Chinn, A	Switching Criteria Study	$232,250	$0	$60,250	$0	-$60,250	Provide up to $200,000 to sponsor a collaborative analysis of alternatives to switching criteria. It is the intent of the Parties to complete the study, and develop and implement revised criteria no later than the end of Year 4.	The Switching Criteria Study is expected to begin in 2005.

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36	Little, R	Steelhead Redd Monitoring	$283,950	$121,077	$36,150	$15,817	-$20,333	Sponsor annual monitoring of steelhead redds for a period of time until prospective flow guidelines and objectives can be established. Monitor steelhead redds for up to eight spawning seasons beginning in Year 1. Total costs of study will not exceed $240,000.	SPU, in collaboration with WDFW continued annual steelhead spawning and incubation studies as provided in Section E.5. Of the Instream Flow Agreement. Final reports are available for results from 2000-2004 studies.
37	Little, R	Chinook Studies	$1,163,410	$478,512	$202,440	$112,726	-$89,714	Work on high priority study topics identified by IFC continued in Year 4. Info. from fall chinook and spring steelhead spawning surveys was used by IFC in allocating supplemental available water to protect all chinook and steelhead redds from dewatering. Preliminary results from the juveline salmon migration monitoring program indicate very robust production of juvenile chinook and sockeye from the Cedar River in 2004.	Work on high priority study topics identified by IFC continued in Year 4. Info. from fall chinook and spring steelhead spawning surveys was used by IFC in allocating supplemental available water to protect all chinook and steelhead redds from dewatering. Juveline salmon migration monitoring results indicate very robust production of juvenile chinook and sockeye from the Cedar River in 2004.
38	Chinn, A	Accretion Flow Study	$479,200	$10,511	$48,200	$8,750	-$39,450	Sponsor a long-term monitoring study to develop a better understanding of inflow patterns throughout the lower river. The study will begin no later than the end of Year 3 and will continue for not less than 10 years. Total costs will not exceed $400,000.	An initial level of accretion flow monitoring has already been started. The IFC and other key participants met at several monthly meetings to discuss the need for the Accretion Flow Study and to design a study plan to carry out continuously over the next 10 years or so.
		SUBTOTALS	**$4,040,090**	**$832,794**	**$383,240**	**$186,112**	**-$197,128**		
Chinook, Coho and Steelhead Monitoring and Research (cost category 7)									
39	Little, R	Counts at Landsburg Fish Ladders	$132,550	$84,081	$60,250	$2,591	-$57,659	Provide up to a total of $110,000 during the first 12 years after completion of upstream fish passage facilities to monitor adult fish passage and better understand run timing, rate of passage, and rate of recolonization. Commitment begins in Year 4.	A total of 51 adult Chinook and 99 adult coho salmon passed upstream during the 2004 brood year. Genetic samples were collected from all fish passed upstream. The 2004 cost commitment was met a year early, as fish ladder operations were initiated in 2003.
40	Little, R	Landsburg Intake Screen Evaluation	$18,080	$47,972	$18,080	$47,972	$29,892	Provide up to $15,000 to perform hydraulic analyses to refine flow characteristics of the screens to demonstrate conformity with hydraulic parameters established during design of passage facility. Commitment begins in Year 4.	Evaluation completed in 2004. Measured intake velocities and made adjustments to the baffles while operating under high water withdrawl flows to ensure intake velocities comply with NOAA Fisheries guidelines. Results were provided to the agencies.
41	Bachen, B	Drinking Water Quality Monitoring	$137,250	$64,213	$0	$0	$0	Provide up to $10,000 per year for up to 6 years to implement water quality sampling program to monitor the effects of coho and chinook salmon spawning carcasses on drinking water quality. Provide $60,000 in Year 1 to help fund collaborative studies with NMFS regarding recolonization of habitat within the municipal watershed by anadromous fish.	No new work was undertaken in 2004. The next sampling period is currently scheduled in 2008, as specified in the HCP.
		SUBTOTALS	**$287,880**	**$196,266**	**$78,330**	**$50,563**	**-$27,767**		

HCP YEAR 4 FINANCIAL MONITORING REPORT
(as of year-end 2004)

Item #	Project Manager	Project Description	50 Year Project Totals: Cost Commitment *(in 2004 $)*	50 Year Project Totals: Life-to-Date Cost Commitment Expenditures	HCP Year 4: Cost Commitment *(in 2004 $)*	HCP Year 4: Cost Commitment Expenditures	HCP Year 4: Cost Commitment Over(+) or Under (-) Expenditures	Performance Commitments *(with $ as stated in HCP, in 1996 $)*	Comments
Sockeye Monitoring and Research (cost category 8)									
42	Bachen, B	Fry Condition at Release	$110,860	$0	$0	$0	$0	Provide $92,000 total, $2,000 annually, Years 5-50 to study physiological, developmental and morphological similarity between artificial and naturally produced fry.	Commitment begins in Year 5.
43	Bachen, B	Fry Marking and Evaluation	$382,100	$83,819	$24,100	$24,865	$765	Provide $320,000 total, $20,000 annually, Years 1-8, 24-27, 42-45 to study fry to adult survival, spawning distribution.	WDFW conducted the otolith marking program in brood year 2004 and established a marking plan for the hatchery based on the main objective of marking production fry by release location in the river (lower, middle, and upper) and timing (early, middle, and late), requiring nine marks. The plan calls for releasing approximately 25% of the fry from Landsburg during the early and middle periods and the remaining fry below the trap in the lower river.
44	Bachen, B	Fry Trapping and Counting	$668,680	$155,106	$42,180	$33,040	-$9,140	Provide $560,000 total, $35,000 annually, Years 1-8, 24-27, 42-45 to study outmigration timing and comparative fry to adult survival for naturally and artificially produced fry.	WDFW conducted fry trapping operations, and provided the final 2002 Cedar River Sockeye Salmon Fry Production Evaluation in September 2004 which provides outmigrant estimates of hatchery and natural origin sockeye for 2002. The final report for similar information for 2003 was released in January, 2005.
45	Bachen, B	Fish Health	$747,100	$0	$0	$0	$0	Provide $620,000 total; $20,000 annually, Years 5-12, 24--27, 42-45; and $10,000 annually, Years 13-23, 28-41, 46-50; to study risks associated with IHN.	Commitment begins in Year 5.
46	Bachen, B	Short-term Fry Rearing	$73,950	$74,673	$12,050	$13,375	$1,325	Provide $65,000 total; $35,000 Year 1; $10,000 annually Years 2-4, to study similarity to naturally produced fry, fry to adult survival.	The rearing study successfully released approximately 4,537,000 fry in 2004 at river mile 0.1 of the Cedar River.
47	Bachen, B	Lake Washington Plankton Studies (year-round)	$571,400	$140,502	$48,200	$35,485	-$12,715	Provide $536,000 total; $40,000 annually Years 1-4, 24-27, 42-56; $7,000 annually Years 5-12; to study plankton abundance, distribution periodicity and effects on fry outmigration timing and in-lake carrying capacity.	Conducted spring and fall midwater trawl & hydroacoustic surveys in Lake Washington to enumerate and size sockeye close to the time that they leave the lake as smolts.
48	Bachen, B	Lake Plankton Studies (spring)	$67,480	$0	$0	$0	$0	Implement a real time spring plankton monitoring program to determine the most appropriate time to release supplemental fry each spring. $7,000 per year in Years 5-12.	Commitment begins in Year 5.
49	Bachen, B	Adult Survival, Distribution, Homing Studies	$957,000	$189,941	$48,200	$49,730	$1,530	Provide $800,000 total; $40,000 annually Years 1-12, 28-31, 46-49; to study fry to adult survival, spawning distribution.	Otoliths were collected from sockeye in the Cedar River. Samples and biological information were collected from adult sockeye carcasses in the Cedar River from October 2004 into January of 2005. Analysis of the otoliths collected in 2003 suggested these fish were approximately 64% natural origin.
50	Bachen, B	Phenotypic and Genetic Studies of Adults	$573,150	$101,631	$36,150	$36,351	$201	Provide $480,000 total; $30,000 annually; Years 1-4, 9-12, 28-31, 46-49 to characterize and monitor changes in phenotypic and molecular genetic traits in Lake Washington sockeye populations in the Cedar River and north Lake Washington tributaries.	Research evaluates the timing and distribution of adult sockeye as they return to Lake Washington and the Cedar River. Project completed its second consecutive year of tagging at the Hiram Chittenden Locks. Researchers tagged 2,922 sockeye with disk tags and 75 with acoustic transmitter.
		SUBTOTALS	**$4,151,720**	**$745,672**	**$210,880**	**$192,846**	**-$18,034**		

HCP YEAR 4 FINANCIAL MONITORING REPORT
(as of year-end 2004)

			50 Year Project Totals		HCP Year 4				
Item #	**Project Manager**	**Project Description**	**Cost Commitment *(in 2004 $)***	**Life-to-Date Cost Commitment Expenditures**	**Cost Commitment *(in 2004 $)***	**Cost Commitment Expenditures**	**Cost Commitment Over(+) or Under (-) Expenditures**	**Performance Commitments *(with $ as stated in HCP, in 1996 $)***	**Comments**
Watershed Aquatic Monitoring and Research (cost category 5)									
51	Beedle, D	Two-Year Experimental Stream Monitoring	$0	$0	$0	$0	$0	Monitoring completed in 1997.	
52	Beedle, D	Long-Term Stream Monitoring	$553,100	$4,957	$65,070	$4,957	-$60,113	Provide $459,000 over the term of the HCP, up to $50,000 per year to conduct monitoring stream temperature, channel stability, BIBI study.	Developed monitoring questions consistent with desired future conditions for different GMUs; began developing long-term monitoring plan; consulted with NOAA Fisheries on watershed scale monitoring and the use of ranked sampling in a long-term monitoring program; completed MOA with USGS to determine the best use of benthic macroinvertebrates to meet the long-term HCP monitoring objectives.
53	Beedle, D	Aquatic Restoration Monitoring	$1,054,380	$6,432	$30,130	$6,432	-$23,698	Provide up to $25,000 per year in Years 4-6, and up to $50,000 per year in Years 7-16, 18, 20, 25, 30, 40 to monitor the success of specific projects implemented through the conservation strategies for the aquatic and riparian ecosystem in the HCP.	Completed pre- and post-project monitoring on the 2004 Rock Creek LWD project; developed monitoring questions consistent with desired future conditions for appropriate GMUs; began development of an aquatic project monitoring plan and determining linkages between project monitoring and long-term stream and riparian monitoring.
54	Paige, D	Bull Trout - Adult Surveys (weir)	$413,000	$11,374	$60,250	$0	-$60,250	Conduct adult surveys at the weir and live-box trap counts in Years 1 through 4.	Factors have recently come to light that make it advisable to at least temporarily delay and reevaluate the ecological risks (and logistics) associated with this project. Decisions on the status of redirecting commitment funds from this project and/or modification of the project as initially proposed are pending.
55	Paige, D	Bull Trout - Adult Surveys (spawning)	$331,280	$124,149	$42,180	$28,614	-$13,566	Conduct spawning surveys in Years 1 through 8.	2003-04 data indicate that the adfluvial bull trout population present in Chester Morse Lake spawned at a level similar to those documented in HCP years 1-3 : a total of a total of 258 redds recorded. 2004-05 data indicate that the adfluvial bull trout population present in Chester Morse Lake spawned at a level exceeding those documented in HCP years 1-4: a total of 587 redds recorded, the highest redd count recorded during the 5 years of survey since implementation of the HCP.
56	Paige, D	Bull Trout - Fry/Juvenile Surveys	$331,280	$65,837	$42,180	$14,570	-$27,610	Conduct juvenile/fry surveys in Years 1 through 8.	Investigated seasonal timing of bull trout fry behavior and production in the Chester Morse Lake drainage basin.
57	Paige, D	Bull Trout - Stream Telemetry Studies	$141,900	$0	$72,300	$0	-$72,300	Initiate a 2-year stream telemetry study within Years 2 to 7.	Will begin work in 2006.
58	Paige, D	Bull Trout - Lake Telemetry Studies	$83,480	$0	$42,180	$0	-$42,180	Initiate lake telemetry studies within years 2 to 7.	Will begin work in 2007.
59	Paige, D	Bull trout - Stream Distribution	$71,040	$22,383	$14,460	$10,073	-$4,387	Conduct distribution surveys up to 5 times between Years 1 and 20.	Efforts focused on consolidating bull trout and other fish species information in a consistent database. Efforts also focused on tributaries of the Cedar and Rex Rivers, Bear Creek, and Boulder Creek. Efforts extended the upper limit of use but did not definitively identify the upper limit of access.
60	Paige, D	Bull Trout - Redd Inundation Study	$128,700	$62,399	$0	$6,004	$6,004	Conduct bull trout redd inundation and egg mortality study in one or more years during Years 1 through 9, up to $60,000 per year.	The initial phase of study began in 2003 to provide information for better evaluation of potential risk of redd inundation during spring reservoir refill; field work continued in 2004 and will be complete in 2005.
61	Paige, D	Common Loon Monitoring	$150,190	$13,163	$3,010	$3,013	$3	Conduct common loon monitoring on an annual basis throughout the term of the HCP. Average annual cost commitment in Years 1-10 is $2750.	Deployed artificial nest platforms in spring 2004 and monitored behavior patterns, habitat use and nesting activity; documented nest establishment in two of three traditional territories in reservoir complex (Rex delta and Masonry Pool).
		SUBTOTALS	**$3,258,350**	**$310,694**	**$371,760**	**$73,663**	**-$298,097**		

HCP YEAR 4 FINANCIAL MONITORING REPORT
(as of year-end 2004)

			50 Year Project Totals		HCP Year 4				
Item #	**Project Manager**	**Project Description**	**Cost Commitment *(in 2004 $)***	**Life-to-Date Cost Commitment Expenditures**	**Cost Commitment *(in 2004 $)***	**Cost Commitment Expenditures**	**Cost Commitment Over(+) or Under (-) Expenditures**	**Performance Commitments *(with $ as stated in HCP, in 1996 $)***	**Comments**
Watershed Terrestrial Monitoring and Research (cost category 5)									
62	LaBarge, A	Assessment of Expanded Forest Stand Data	$88,630	$29,880	$12,050	$8,798	-$3,252	Prepare preliminary design and conduct evaluation in Years 1 through 5.	A total of 60 Permanent Sample Plots were established in second-growth forest habitat throughout watershed, which will be used to monitor habitat change. 1992-93 review of forest inventory stand and attribute data and remote sensing data layers determined taht data is insufficient to meet upland forest restoration project needs. Assessed plot-level data to determine their value in new remote sensing image data and classification system.
63	LaBarge, A	Assessment of Expanded Forest Attribute Data	$88,630	$25,820	$12,050	$9,298	-$2,752	Design and conduct evaluation of preliminary sampling effort in Years 1 through 5.	See above.
64	LaBarge, A	Augmentation of Forest Habitat Inventory	$87,750	$62,738	$18,080	$26,800	$8,720	Design and conduct sampling program to augment existing forest and habitat inventory data for the watershed in Years 1 through 5.	See above.
65	LaBarge, A Paige, D	Long-Term Forest Habitat Inventory (including old-growth classification and field verification)	$629,780	$106,197	$29,370	$39,271	$9,901	Design program during Years 1-5.	See above.
66	LaBarge, A	Habitat Restoration - Riparian Forest Development	$403,530	$3,619	$7,030	$1,403	-$5,627	Design and initiate program during Years 3 through 8.	Monitoring occurred on three projects: Webster, Shotgun
67	LaBarge, A	Habitat Restoration - Upland Forest Development	$403,530	$23,255	$7,030	$8,072	$1,042	Design and initiate program during Years 3 through 8.	Monitoring occurred on upland restoration thinning project sites. Post-treatment monitoring occurred on the 45 Road site. Permanent sample plots were installed and habitat inventory information in the lower watershed collected will serve as a baseline measurement for forest change over time.
68	Paige, D	Marbled Murrelet - Survey, Old Growth	$89,750	$0	$30,130	$0	-$30,130	Conduct baseline surveys during Years 3 through 8.	Delayed from starting in 2003 as originally planned until 2005 for budget reasons, but still consistent with the timing requirements of HCP.
69	Paige, D	Marbled Murrelet - Baseline Survey, Second Growth	$180,750	$0	$0	$0	$0	Develop and implement sampling plan and conduct field surveys to evaluate habitat potential, and subsequently develop and implement a prioritized sampling plan to document occupancy during HCP years 5 through 8.	Commitment begins in Year 5.
70	Paige, D	Marbled Murrelet - Long Term Surveys	$120,500	$0	$0	$0	$0	Conduct surveys during Years 25 through 28.	Commitment begins in Year 25.
71	Paige, D	Marbled Murrelet - Experimental Habitat Study	$222,930	$0	$0	$0	$0	Development and initiation in Years 7 through 10.	Commitment begins in Year 7.
72	Paige, D	Spotted Owl - Baseline Survey	$89,750	$0	$0	$0	$0	Conduct survey during Years 3 through 10.	Delayed from starting in 2003 as originally planned until 2005 for budget reasons, but still consistent with the timing requirements of HCP.
73	Paige, D	Spotted Owl - Site Center Survey	$90,380	$0	$0	$0	$0	Conduct survey in Year intervals 11-20, 21-30 and 31-50.	Commitment begins in Year 11.
74	Paige, D	Optional Species/Habitat Surveys	$180,750	$0	$0	$0	$0	Conduct research in Year intervals 9-20, 21-35 and 36-48.	Commitment begins in Year 9.
75	VanBuren, T	Data/GIS Compatibility	$179,660	$46,528	$7,530	$7,530	$0	Integrate data collection formats to make them compatible with watershed GIS systems and provide for mapping and analysis capability in Years 1 through 8.	Created production instance of Transportation Info. Mgmt. System; installed map viewing software on all watershed desktops and published data driven maps; derived information products from LIDAR; developed resources to facilitate map production by staff.
76	Paige, D	Forest Habitat Modeling	$88,730	$25,310	$11,300	$6,677	-$4,623	Design modeling in Years 1 through 8.	See comment for Assessment of Expanded Forest Stand Data.
77	Richards, B	Species-Habitat Relations Modeling	$207,380	$59,214	$24,100	$14,840	-$9,260	Evaluate and design modeling in Years 1 through 5.	Investigated effects of planned ecological thinning projects on wildlife habitat structure at selected sites. Evaluated MASTER and LIDAR remotely sensed data as a potential source of data. Collected field data in lower elevations second growth stands for modeling and restoration planning.
		SUBTOTALS	**$3,152,430**	**$382,561**	**$158,670**	**$122,689**	**-$35,981**		

HCP YEAR 4 FINANCIAL MONITORING REPORT
(as of year-end 2004)

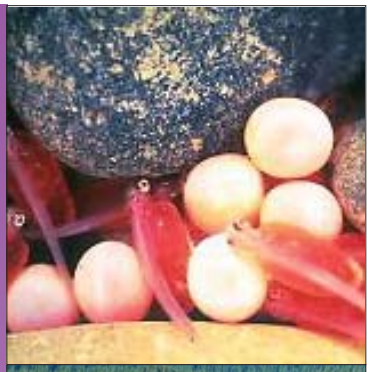
Item #	Project Manager	Project Description	50 Year Project Totals: Cost Commitment *(in 2004 $)*	50 Year Project Totals: Life-to-Date Cost Commitment Expenditures	HCP Year 4: Cost Commitment *(in 2004 $)*	HCP Year 4: Cost Commitment Expenditures	HCP Year 4: Cost Commitment Over(+) or Under (-) Expenditures	Performance Commitments *(with $ as stated in HCP, in 1996 $)*	Comments
Cedar Permanent Dead Storage Evaluation (cost category 6)									
78	Schneider, G	Engineering, Water Quality, & Economic Studies	$819,000	$4,162	$168,700	$0	-$168,700	Conduct engineering studies to address design options, siting, water quality, geology and hydrology, yield analysis, costs and economics, constructibility, reliability, and other factors for development of permanent non-emergency access to water stored below Morse Lake. Commence not later than end of HCP Year 5 and take 10 Years to complete (per IFA amendment), and will not exceed $700,000.	Scoped and initiated work that included hydraulic and hydrologic studies concerning the magnitude and timing of Cedar and Rex river inflows across the delta fans and into the reservoir, and the near completion of hydrographic surveys of the Cedar and Rex river deltas.
79	Paige, D	Bull Trout - Spawning Impedance (Passage Assistance Plan)	$76,050	$68,320	$15,670	$67,688	$52,018	Conduct environmental studies to address potential effects of permanent non-emergency access to water stored below Morse Lake on resident fish and wildlife populations and wetlands. Commence not later than end of HCP Year 5 and take 10 Years to complete. Total costs will not exceed $745,000.	Work scheduled to begin in 2006.
80	Basketfield, D	Bull Trout - Spawning Impedance (Delta Modeling)	$336,760	$0	$87,360	$0	-$87,360	See Performance Commitment for Item #79 above.	Work scheduled to begin in 2005.
81	Paige, D	Pygmy Whitefish/Rainbow Trout Studies	$333,900	$0	$168,700	$0	-$168,700	See Performance Commitment for Item #79 above.	Work scheduled to begin in 2006.
82	Paige, D	Delta Plant Community Monitoring	$94,600	$0	$48,200	$0	-$48,200	See Performance Commitment for Item #79 above.	Work scheduled to begin in 2006 or beyond.
83	Paige, D	Common Loon Nesting Habitat Monitoring	$36,150	$84	$0	$0	$0	See Performance Commitment for Item #79 above.	Work scheduled to begin in 2006.
		SUBTOTALS	**$1,696,460**	**$72,566**	**$488,630**	**$67,688**	**-$420,942**		
		RESEARCH AND MONITORING TOTALS	**$16,586,930**	**$2,540,553**	**$1,691,510**	**$693,561**	**-$997,949**		
		HCP GRAND TOTALS	**$94,040,590**	**$30,646,973**	**$11,075,290**	**$4,159,931**	**-$6,915,359**		

Note for Item #15: Construction of Intake Screens, Construction of Fish Ladders, Construction of Downstream Passage, and Contingency Fund for Fish Passage Facilities are combined into one project, Landsburg Fish Passage.

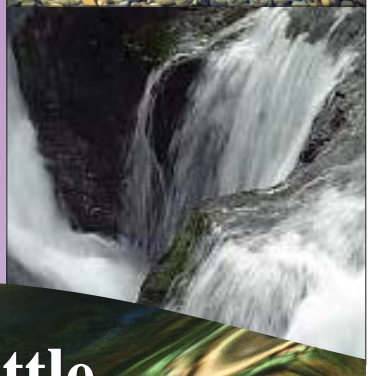
Cost Commitment Category	Year 4 Cost Commitment	HCP Year 4 Actual
1. Watershed Management	**$1,352,440**	**$1,279,926**
2. Instream Flow Management	**$1,241,150**	**$584,328**
3. Mitigation for Chinook, Coho & Steelhead	**$849,540**	**$992,978**
4. Mitigation for Sockeye	**$5,940,650**	**$609,138**
5. Watershed Research & Monitoring	**$530,430**	**$196,352**
6. Instream Flow Research & Monitoring	**$871,870**	**$253,800**
7. Chinook, Coho & Steelhead Research & Monitoring	**$78,330**	**$50,563**
8. Sockeye Research & Monitoring	**$210,880**	**$192,846**
TOTALS	**$11,075,290**	**$4,159,931**

BPA FINANCIAL MONITORING REPORT

Project Manager	Project Description	Total Cost	Life-to-Date Expenditures	2004 Expenditures	Remaining Dollars	Comments
CIP						
Erckmann, J	Aquatic/Riparian Restoration	$1,493,000	$274,869	$274,869	$1,218,131	A comprehensive program was developed and implementation initiated for improvement to the three acquired properties and for security enhancements. Development of needed information management systems was initiated for all of the four project categories, including the HCP. Adult coho were tracked and coho and Chinook redds surveyed. Analysis was conducted on the feasibility of reconnecting Walsh Lake to Rock Creek. Large woody debris was placed in Rock Creek. Stream crossings at several roads were improved. Road improvement needs were assessed. Forest fire hazards were assessed and management options identified and work was started with the University of Washington for ecological thnning experimentation.
Anderson, C	Roads Decommissioning/Commissioning	$1,274,000	$190,522	$190,522	$1,083,478	
Davis, D	Security Measures	$835,000	$279,589	$279,589	$555,411	
Erckmann, J	Upland Forest Restoration	$942,000	$175,477	$175,477	$766,523	
	Total CIP	**$4,544,000**	**$920,457**	**$920,457**	**$3,623,543**	
O&M						
Erckmann, J	Watershed Management Division	$1,880,770	$15,935	$15,935	$1,864,835	The BPA Mitigation Program was approved by City Council mid-year and development of specific program needs and management was initiated.
Coburn, G	Resource Planning Division	$215,230	$7,230	$7,230	$208,000	
	Total O&M	**$2,096,000**	**$23,165**	**$23,165**	**$2,072,835**	
	TOTAL BPA MITIGATION PROGRAM	**$6,640,000**	**$943,622**	**$943,622**	**$5,696,378**	



Annual Compliance Report - Instream Flow Agreement



City of Seattle

Seattle Public Utilities & Seattle City Light

Chester Morse Reservoir (photo by Ralph Naess)

ANNUAL COMPLIANCE REPORT

INSTREAM FLOW AGREEMENT

for the

CEDAR RIVER

March 2005

SEATTLE PUBLIC UTILITIES and SEATTLE CITY LIGHT

HCP YEAR 4

JANUARY 1 through DECEMBER 31, 2004

The City of Seattle influences river flows in the Cedar River through its water supply and hydroelectric operations within the municipal watershed. Water from the Cedar River is used by about two-thirds of the City's 1.3 million customers in King and Snohomish Counties. The objective of the Instream Flow Agreement (IFA), one of several agreements that establish the provisions of the Cedar River Watershed Habitat Conservation Plan (HCP), is to provide highly beneficial conditions for instream resources, while preserving Seattle's water supply and power generation capabilities.

The IFA establishes an inter-agency body, the Cedar River Instream Flow Commission (IFC), to assist the City in carrying out its river management responsibilities. The IFC was first convened in July 2000, and has met, on average, every month since then. Meetings are chaired by SPU and have been very well attended.

HCP Year 4 was marked by several unique hydrologic patterns that significantly affected instream flow management practices. An initially robust snowpack dwindled during the late spring and melted approximately one month early. Early snowmelt, complicated reservoir refill efforts and also resulted in relatively dry watershed conditions during the spring. Relatively heavy rainfall in late May provided for successful reservoir refill. In late summer, unusually heavy rainfall in late August and again in mid-September established favorable hydrologic conditions for returning salmon. A relatively wet pattern persisted through November. December provided somewhat drier and significantly warmer than normal weather with very unusually low snow pack accumulations by the end of the month. IFC members remained very engaged in real-time stream flow management decisions that appeared to result in quite beneficial conditions for instream resources throughout the year. IF members helped guide the development and implementation of complex supplemental studies and other technical analyses. The efforts of the IFC members are herein recognized for their vital role in achieving the successes in 2004. Organizational membership and representation is as follows:

- National Marine Fisheries Service – Voting Member (Tom Sibley)
- U.S. Fish and Wildlife Service – Voting Member (Tim Romanski)
- Washington Department of Fish and Wildlife – Voting Member (Gary Engman)
- Washington Department of Ecology – Voting Member (Steve Hirschey)
- Muckleshoot Indian Tribe – Voting Member (Holly Coccoli, Eric Warner, Carla Carlson)
- City of Seattle – Voting Member (representing both Seattle Public Utilities and Seattle City Light) (Liz
- Ablow, Karl Burton, Alan Chinn, Tom Johanson, Rand Little, George Schneider)
- Corps of Engineers – Non-voting Member (Lynn Melder)
- King County – Non-voting Member (Kelly Whiting)

In addition, it is recognized that it takes many people in an organization to translate good intentions into successful operations. Providing beneficial conditions for fish and other instream resources in the Cedar River is a 24-hour – 365-day a year responsibility. **Special thanks go to staff from:**

- Cedar Falls Headworks (Seattle City Light)
- Water Supply and Treatment Section (Landsburg Operators and Control Center)
- Operations Transition Section
- Watershed Management Division
- Water Management Section

CEDAR RIVER

ANNUAL FLOW COMPLIANCE REPORT

City of Seattle

HCP Year 4

January 1 through December 31, 2004

Seattle Public Utilities and Seattle City Light, for the City of Seattle, present this report to the Cedar River Instream Flow Oversight Commission ("Commission") as documentation of compliance with flow requirements established in the 2000 Instream Flow Agreement (IFA) for the Cedar River. The IFA is part of the City's Cedar River Watershed Habitat Conservation Plan (HCP). Section D.3(a) of the IFA stipulates that an annual compliance report be submitted to the Commission. This annual report covers the period January 1, 2004 through December 31, 2004.

Throughout this report, direct excerpts from the IFA are presented within quotation marks.

Flow compliance is measured at several locations throughout the Cedar River Watershed including:

USGS Gaging Station 12115000 – Cedar River near Cedar Falls, Washington (this gage located at River Mile (RM) 43.5 measures unregulated inflows to Morse Lake).

USGS Gaging Station 12115900 – Chester Morse Lake at Cedar Falls, Washington (this gage located at the Overflow Dike at RM 37.2 measures water surface elevation of Chester Morse Lake).

USGS Gaging Station 12116400 – Cedar River at Powerplant at Cedar Falls (this gage located at RM 33.7 immediately upstream of the Cedar Falls Powerhouse measures regulated streamflow downstream of Masonry Dam. Note: Date of installation Oct. 1, 2001).

USGS Gaging Station 12116500 – Cedar River at Cedar Falls, Washington (this gage located at RM 33.2 immediately below the Cedar Falls Powerhouse measures regulated streamflow down stream of the Cedar Falls Powerhouse).

Seattle Public Utilities Diversion - the volume of water (millions of gallons per day) diverted for municipal use is monitored at the Landsburg Diversion Dam.

USGS Gaging Station 12117600 – Cedar River below Diversion near Landsburg, Washington (this gage, located at RM 20.4 measures regulated streamflow downstream of Landsburg Diversion Dam).

I. INSTREAM FLOWS BELOW LANDSBURG DIVERSION DAM

In accordance with IFA Section B.1.a, the instream flows "consist of two types of commitments by the City. The minimum instream flows or volumes, as described in Sub-sections B.2., B.4., B.6., B.7., and B.8" of the IFA "represent requirements of the City and are referred to as "firm" flows or volumes". "Additional flows or volumes provided to supplement minimum flows, as described in sub-sections B.3. and B.5." of the IFA "represent goals of the City and are referred to as 'non-firm' flows or volumes".

A. Minimum Instream Flows below Landsburg Diversion Dam

Compliance with minimum flow requirements is assessed at one monitoring location within the Cedar River Watershed: USGS Gage 12117600 - Cedar River below Diversion near Landsburg

Requirements

Required minimum flows are shown below for USGS Gage 12117600 and are specified in Sec. B.2.c. of the Instream Flow Agreement.

Compliance

During the reporting period, the project was in compliance with the Instream Flow Agreement for the minimum flow at USGS Gage 12117600. Provisional mean daily flows for the reporting period are shown in Table 1 and graphed in Figure 1. The agreed on operational 2004 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

B. "Non-Firm" Flow Supplement in late Winter and Early Spring for Sockeye Outmigration

"Between February 11 and April 14, the City will, as a goal, expect to supplement the normal minimum instream flows listed in sub-section B.2.c. by 105 cfs at least 70% of the time through out said period in any year in which normal flows are in effect throughout said period."

Compliance

The City met and exceeded the goal this year by providing more than 105 cfs for supplemental flow 100% of the time. In addition, the City maintained minimum stream flows at levels that were approximately 100 cfs higher than prescribed supplemental levels from the first of the year through mid-April to provide enhanced protection for incubating sockeye salmon.

C. "Firm Block" of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

"Between June 17 and August 4, in addition to the normal minimum flows listed in subsection B.2.c., the City shall provide such supplemental flow volumes as the Commission may direct, provided that the total volume of such supplemental flows shall not exceed 2500 acre feet of water, and that other procedures and conditions in this sub-section B.4. are met." The agreed on operational 2004 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

Compliance

The City provided supplemental flow volumes as the Commission directed. See Table 1 and Figure 1.

D. "Non-Firm Block" of Water in Early Summer to Supplement Normal Minimum Flows for Steelhead Incubation

"Between June 17 and August 4, in addition to the normal minimum flows listed in sub-section B.2.c, and the "firm block" described in sub-section B.4, the City will, as a goal and under the conditions set forth in sub-section B.5, expect to further supplement normal minimum flows by 3500 acre feet of "non-firm" water in 63% of all years." The agreed on operational 2004 minimum instream flow schedule with firm and non-firm flows are shown in Table 2 and graphed in Figure 1.

Compliance

With relatively heavy rains and successful reservoir refill in late May, the City was able to offer the non-firm block of water. However, with the early snowmelt and no risk of steelhead redd dewatering, the Commission voted on June 2 not to recommend the non-firm block be provided this year, although the City made it available. See Table 1 and Figure 1.

For long-term tracking purposes, this goal has been met in 3 years out of 5 (60%). The IFA set 63% as an expectation.

Higher Normal and Critical Minimum Flows in September for Sockeye and Chinook Spawning

"In any year in which the temporary flashboards, as they presently exist in the City's Overflow Dike or may hereafter be reconstructed, are in place throughout the period of June 1 through September 30, the normal minimum flows listed in sub-section B.2.c. shall be increased by the amount of 38 cfs between September 15 and 22, and by the amount of 115 cfs between September 23 and 30, and the critical minimum flows shall be increased by the amount of 10 cfs through the period between September 1 and 15."

Compliance

Temporary flashboards were in place throughout the period June 1 through September 30, 2004 and the City provided the additional flows. See Table 1 and Figure 1.

F. Two-Part Normal Minimum Flow Regime in the fall for Sockeye and Chinook Spawning

"Between October 8 and December 31, the City shall provide either high-normal minimum flows of 330 cfs or low-normal minimum flows of 275 cfs, except when flows are reduced to critical minimum flows under the terms of sub-section B.8. More specifically, the City, beginning on October 8, will meet the high-normal and low - normal flow regimes with the following long-term average frequencies assuming that the critical minimum flow regime will be in effect at a long-term average frequency of one of ten years:"

"The City will follow the high-normal minimum flow regime in six of ten years, provided that it may switch down to low-normal in one of those years when actual or forecasted water availability conditions worsen significantly from those projected and understood at the time of the decision to provide high-normal minimum flows."

"The City may follow the low-normal minimum flows in three of ten years, provided that it will switch up to high-normal at such time after October 8 if the City determines that improving conditions allow, or when criteria for high-normal are met, whichever comes first."

Compliance

The City provided high-normal minimum flows exceeding 330 cfs from October 8 through December 31,2003, during the expected peak of the sockeye and chinook spawning season. See Table 1 and Figure 1.

For long term tracking purposes, the following table compares expected with actual performance (expressed as percentage of all years).

Week Period	Actual 2004	Expected High %	Expected Low %	Actual 00-04 High %	Actual 00-04 Low %
Oct 8 - Oct 14	High	60	30	80	20
Oct 15 - Oct 21	High	60	30	100	0
Oct 22 - Oct 28	High	60	30	80	20
Oct 29 - Nov 4	High	50	40	80	20
Nov 5 - Nov 11	High	55	35	80	20
Nov 12 - Nov 18	High	65	25	80	20
Nov 19 - Nov 25	High	65	25	80	20
Nov 26 - Dec 2	High	70	20	80	20
Dec 3 - Dec 9	High	75	15	80	20
Dec 10 - Dec 16	High	75	15	80	20
Dec 17 - Dec 23	High	80	10	80	20
Dec 24 - Dec 31	High	80	10	80	20

G. Reductions to Critical Minimum Flows

Sub-section B.8 of the IFA "describes the circumstances under which the Parties agree that the City may switch to the minimum flow levels indicated in the column headed "Critical Flows" in the table which appears in sub-section B.2.c., until such time as those criteria may be modified pursuant to section E.4."

Compliance

The City did not switch to the critical flow levels at any time during the reporting period. See Table 1 and Figure 1.

II. OTHER OPERATING AND FACILITY IMPROVEMENTS

A. Instream Flows Above Landsburg Diversion Dam

"After construction of a fish ladder at Landsburg Diversion Dam and subsequent upstream passage of selected species of anadromous fish, the City will provide a minimum flow of 30 cfs on a continuous basis to protect rearing habitat in the Cedar River "Canyon Reach," measured by a new USGS stream gage installed on October 1, 2001, near river mile 33.7 and funded by the City."

Compliance

Fish ladder was completed and operational September 1, 2003. The first anadromous fish passed above Landsburg Diversion Dam on September 19, 2003, which marks the date the City will provide a minimum flow of 30 cfs on a continuous basis in the Cedar River "Canyon Reach."

During the reporting period, the project was in compliance with the Instream Flow Agreement or the minimum flow at USGS Gage 12116400. Provisional mean daily flows for the reporting period are shown in Table 10 and hourly flows are graphed in Figure 4.

B. Downramping Below City Facilities

1. Downramping Below Masonry Dam

a. General

(1) The downramping rates and procedures set forth in this sub-section C.2.a will become effective not later than the end of HCP Year 4 (2004) and will apply to operations at Masonry Dam when flows are less than 80 cfs.

"Adopted ramping rates, criteria and procedures will become effective only after construction of a fish ladder at Landsburg Dam and upstream passage of anadromous fish."

(2) The measuring point for downramping rates at the Masonry Dam will be the USGS gage number 12116400 located below the Dam at river mile 33.7. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.a will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.a will not apply when flows exceed 80 cfs

b. Downramping During Normal Operations

(1) Between February 1 and October 31, on an interim basis the maximum downramping flow rate will be two inches per hour. Once the new equipment is in place, the City will undergo downramp testing. The Commission will adopt final ramping criteria once testing is complete, which was to occur no later than HCP year 4. City Light proposed and the Commission agreed that finalization of downramping provisions would occur once final testing of new equipment is complete in HCP year 5.

(2) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

Compliance

The current year is HCP Year 4 (2004). Fish passage above Landsburg on September 19, 2003 marked when the City will implemented the new interim downramping guidelines in the Cedar River "Canyon Reach." There were no downramping events for year 2004 (see Figure 5).

2. Downramping Below Cedar Falls Powerhouse

a. General

(1) The downramping rates and procedures set forth in this sub-section C.2.b will become effective not later than the end of HCP Year 4 (2004) and will apply to operations at Cedar Falls Powerhouse when flows are less than 300 cfs.

"Adopted ramping rates, criteria and procedures will become effective only after construction of a fish ladder at Landsburg Dam and upstream passage of anadromous fish."

(2) The measuring point for downramping rates at the Cedar Falls Powerhouse will be the existing USGS gage number 12116500 located ? mile below the Powerhouse at river mile 33.2. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.b will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

(3) The downramping rates and prescriptions set forth in this sub-section C.2.b will not apply when flows exceed 300 cfs

b. Downramping During Normal Operations

(1) Between February 1 and June 15, the maximum downramping flow rate will be two inches per hour with no daylight downramping (defined as one hour before sunrise until one hour after sunset).

(2) Between June 16 and October 31, the maximum downramping flow rate will be one inch per hour.

(3) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

c. Downramping during full system shutdown

(1) Based on past experience, full system shutdown at flows less than 300 cfs can be expected to occur one to two times per year due to low flow conditions or for scheduled and unscheduled maintenance or construction projects.

(2) When the lone unit is shutdown the wicket gates close at a prescribed speed (a condition of the machine safety mechanisms), which results in a sudden drop in flow, averaging a total of 25 cfs per occurrence.

d. Swapping load during daytime downramping restrictions

(1) During daytime downramping restrictions there may be a need to swap loads between generators. In most circumstances it is seamless and would not show up as a change in stage. However, there are situations in moving water from one machine to the other, due to the normal shutdown sequence, that can cause a sudden drop followed by an increase, or vice-versa. These are typically short duration occurrences.

e. Extended shutdowns during the February to June 15 time frame.

(1) The City will notify the IFC ahead of time of the circumstances that will require an extended shutdown and discuss the need for leniency on daytime downramping.

Compliance

The current year is HCP Year 4 (2004). Fish passage above Landsburg September 19, 2003 marked when the City implemented the new interim downramping guidelines in the Cedar below Cedar Falls Powerhouse. The downramping guidelines were finalized by the IFC in January, 2005. The significant downramping events for year 2004 are shown in Figures 6 & 7 and the following tables in this section.

Below Cedar Falls Powerhouse: Events exceeding no daytime downramp, and night time maximum downramping flow rate of two-inch per hour and less than 300 cfs from February 1 through June 15, 2004:

Date	Hour	Rate per Hour	cfs	Description
April 16	6:30	-2.5”	165	(1)
June 14	8:30	1.9”	122	(2)

(1) Unit 5 tripped off-line, the emergency bypass system activated, providing flow continuation but did not completely match pre-event flows, resulting in a downramp exceedance during a no daytime downramp time restriction.

(2) A large system wide frequency excursion caused the flow fluctuation and affected the entire Western United States.

Below Cedar Falls Powerhouse: Events exceeding maximum downramping flow rate of one-inch per hour and less than 300 cfs between June 16 through October 31, 2004:

Date	Hour	Rate per Hour	cfs	Description
				none

Below Cedar Falls Powerhouse: Events exceeding maximum downramping flow rate of two-inch per hour and less than 300 cfs between January 1 through January 31 and November 1 through December 31, 2004:

Date	Hour	Rate per Hour	cfs	Description
				none

3. Downramping Below Landsburg Dam

   a. "General

      (1) The downramping rates and procedures set forth in this sub-section C.2.c will become effective not later than the end of HCP Year 2" (2002) "and will apply to operations at Landsburg Diversion Dam when flows are less than 850 cfs.

      (2) The measuring point for downramping rates at the Landsburg Diversion Dam will be the existing USGS gage number 12117600 located below the Dam at river mile 20.4. Not later than the end of HCP Year 2, the City will install equipment to monitor this gage on a "real time" basis. For compliance purposes, specific ramping rate values set forth in this sub-section C.2.c will be calculated from provisional real time data and gage error, as determined by USGS, shall be factored into the ramping rate calculation.

      (3) The downramping rates and prescriptions set forth in this sub-section C.2.c will not apply when flows exceed 850 cfs.

   b. Downramping During Normal Operation

      (1) Between February 1 and October 31, the maximum downramping flow rate will be one inch per hour.

      (2) Between November 1 and January 31, the maximum downramping flow rate will be two inches per hour.

      (3) The tainter gates will be down and closed during normal operation.

   c. During Startup Following Full System Shutdown

      (1) Based on past experience, full system shutdown at flows less than 850 cfs can be expected to occur one to two times per year for scheduled and unscheduled maintenance, and at least once per year for forebay cleaning. Shutdowns for construction may also occur depending on the nature of the construction project."

      (2) "To minimize risk of cavitation and mechanical damage of equipment at Landsburg Diversion Dam, initial downramping following full system shutdown will be at a maximum of 60 cfs per hour.

(3) Not later than the end of HCP Year 2 and as part of the City's current evaluation of forebay cleaning procedures with WDFW, the City will propose downramping rates and procedures for operation of the tainter gate. After consideration of the City's proposal, the Commission will adopt final ramping criteria, but such criteria must be capable of implementation with existing equipment (for example, the City must have the mechanical ability to ramp at the recommended rate)."

With the accelerated schedule for completion of the fish passage facilities, use of tainter gates to drain the forebay will be very limited. Draining and refilling of the forebay will be accomplished primarily through the operation of the newly installed, vertically hinged, tip-out gate in bay #2 of the Landsburg Dam. SPU proposed and the Commission agreed that downramping provisions associated with forebay draining and refilling would be developed after installation and testing of the new tip-out gate.

Compliance

Current year is HCP Year 4 (2004) and the downramping limits were in effect during this period. There were five significant downramping events for year 2004; they are shown in Figures 2 and 3, Tables 9 (1-3) and the following tables (see next page).

Below Landsburg: Events exceeding the maximum downramping flow rate of one inch per hour and less than 850 cfs between February 1 and October 31, 2004:

Date	Hour	Rate per Hour	cfs	Comments
February 11	20:00	-1.08"	727	(1)
May 26	18:00	-1.56"	786	
May 28	17:00	-1.08"	443	(2)
August 24	12:00	-2.52"	630	(4)
August 25	13:00	-1.35"	753	Looks natural
September 11	11:00	-1.32"	554	Looks natural
	12:00	-1.08"	512	Looks natural
September 12	2:00	-1.56"	358	No Violation (3)
September 23	0:00	-1.44"	625	

(1) DP gate operated in response to City Light Operation. Parameters for the gate were most likely set to fast

(2) LYSL #5. Seems to have been opened too fast. 0-15 MGD in an hour.

(3) Following full system shutdown.

(4) Landsburg diversion shutdown and hydraulic testing & calibration and V-screen test

Below Landsburg: Events exceeding the maximum downramping flow rate of two inches per hour and less than 850 cfs between January 1 - 31, 2004 and November 1 through December 31, 200:

Date	Hour	Rate per Hour	cfs	Comments
				none

C. Municipal Water Use

The HCP provides that " The City …is dedicated to managing water diversions from the Cedar for the next 5 to 10 years in the same range that water diversions have been for the last five years (98-105 mgd on an annual average basis)."

Compliance

The City was in compliance with the provision in 2004. Actual average annual water diversion in 2004 was 86 mgd. (See Table 6.)

III. MEASUREMENT AND REPORTING

Annual reports are provided to the Commission to evaluate the City's compliance with the terms of the Instream Flow Agreement. "The reports will also include tables of precipitation levels, reservoir in-flow, reservoir out-flow, and Chester Morse Lake levels and usage." These flow and elevation records are described below.

A. USGS Gage 12117600, Cedar River below Diversion nr Landsburg
Data provided in Table 1 and shown in Figure 1.

B. USGS Gaging Station 12116500 – Cedar River at Cedar Falls
Data provided in Table 3

C. USGS Gaging Station 12116400 – Cedar River at Powerplant at Cedar Falls
Data provided in table 10

D. USGS Gaging Station 12115900 – Chester Morse Lake at Cedar Falls
Data provided in Table 4

E. USGS Gaging Station 12115000 – Cedar River near Cedar Falls
Data provided in Table 5

F. SPU Landsburg Tunnel Flow (MG) – Cedar River Landsburg Diversion
Data provided in Table 6

G. SPU Landsburg Weather Station – Precipitation 24 hour Total (inches)
Data provided in Table 7

H. SPU Masonry Weather Station – Precipitation 24 hour Total (inches)
Data provided in Table 8

I. USGS Gage 12117600, Cedar River below Diversion nr Landsburg
Downramping flow data in one-hour increments in Table 9 (1-3)

Figure 1

Last Update: 12/31/2004

Calendar Year 2004

Cedar River Instream Flows Measured at USGS Stream Gage No. 12117600

All Data is Provisional and Subject to Revision

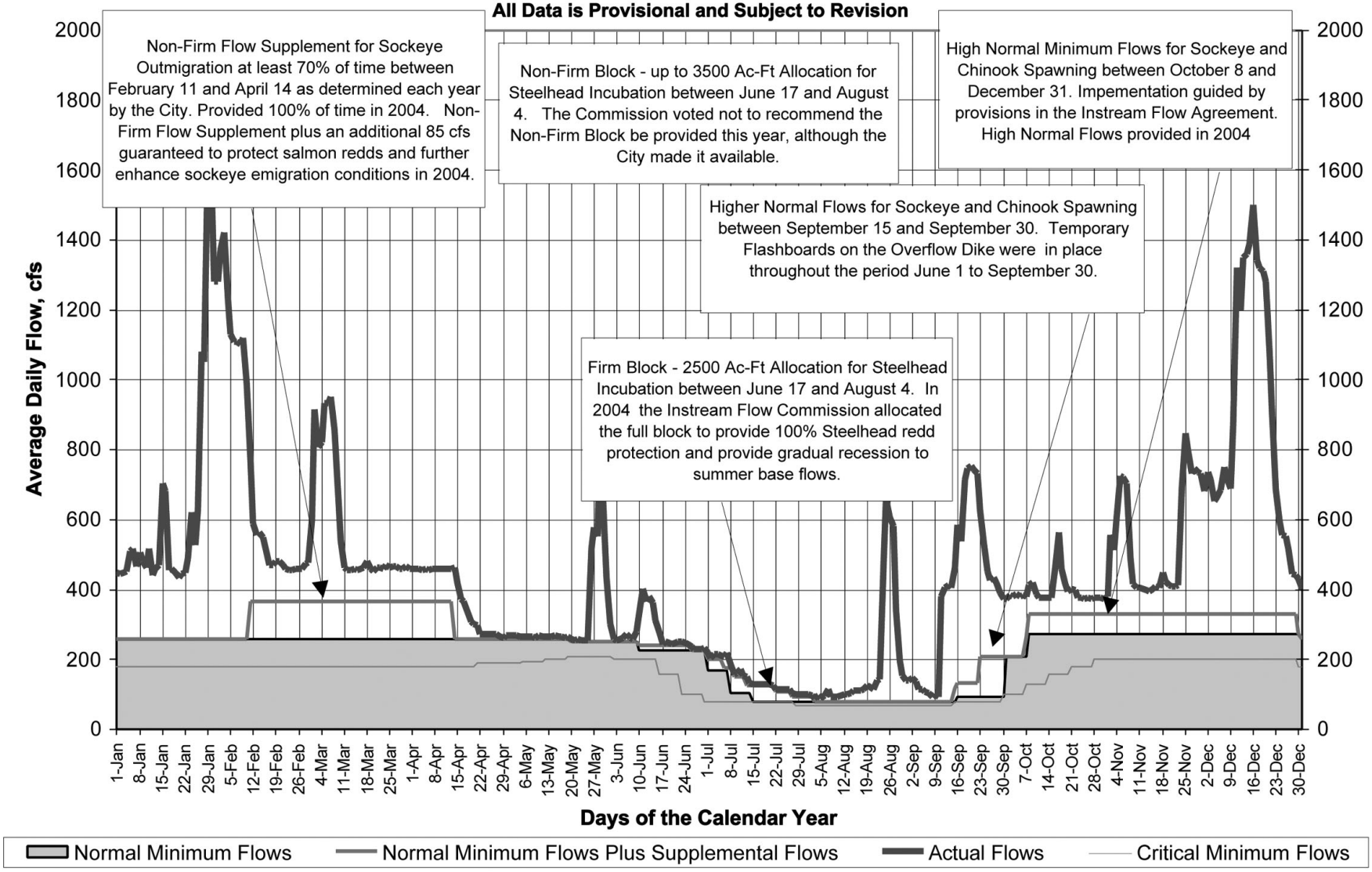


Figure 2

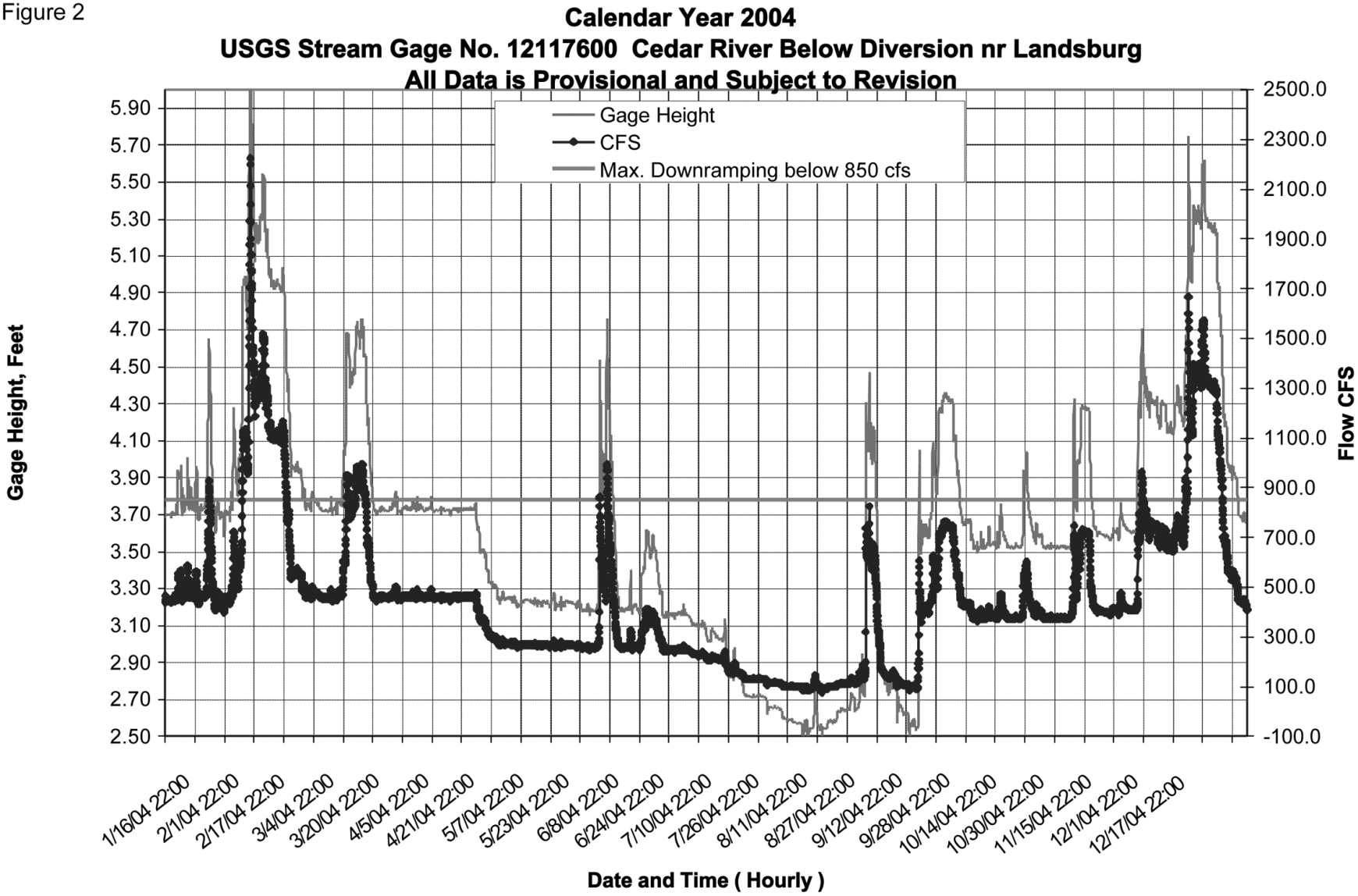
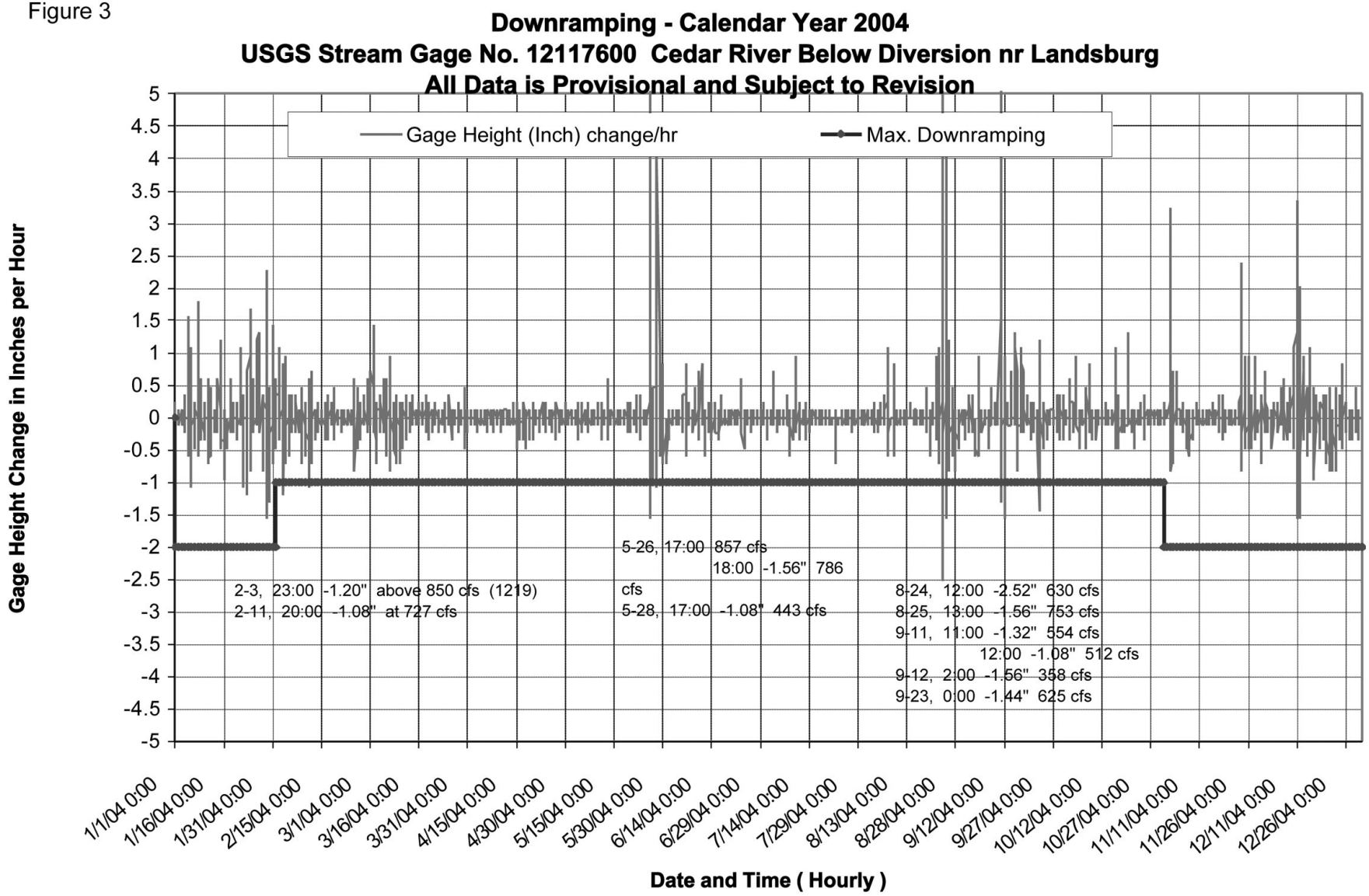

Calendar Year 2004
USGS Stream Gage No. 12117600 Cedar River Below Diversion nr Landsburg
All Data is Provisional and Subject to Revision
Gage Height
CFS
Max. Downramping below 850 cfs
Gage Height, Feet
Flow CFS
5.90
5.70
5.50
5.30
5.10
4.90
4.70
4.50
4.30
4.10
3.90
3.70
3.50
3.30
3.10
2.90
2.70
2.50
2500.0
2300.0
2100.0
1900.0
1700.0
1500.0
1300.0
1100.0
900.0
700.0
500.0
300.0
100.0
-100.0
1/16/04 22:00
2/1/04 22:00
2/17/04 22:00
3/4/04 22:00
3/20/04 22:00
4/5/04 22:00
4/21/04 22:00
5/7/04 22:00
5/23/04 22:00
6/8/04 22:00
6/24/04 22:00
7/10/04 22:00
7/26/04 22:00
8/11/04 22:00
8/27/04 22:00
9/12/04 22:00
9/28/04 22:00
10/14/04 22:00
10/30/04 22:00
11/15/04 22:00
12/1/04 22:00
12/17/04 22:00
Date and Time (Hourly)

Figure 3


Downramping - Calendar Year 2004
USGS Stream Gage No. 12117600 Cedar River Below Diversion nr Landsburg
All Data is Provisional and Subject to Revision
Gage Height (Inch) change/hr
Max. Downramping
Gage Height Change in Inches per Hour
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
-4.5
-5
2-3, 23:00 -1.20" above 850 cfs (1219)
2-11, 20:00 -1.08" at 727 cfs
5-26, 17:00 857 cfs
18:00 -1.56" 786
cfs
5-28, 17:00 -1.08" 443 cfs
8-24, 12:00 -2.52" 630 cfs
8-25, 13:00 -1.56" 753 cfs
9-11, 11:00 -1.32" 554 cfs
12:00 -1.08" 512 cfs
9-12, 2:00 -1.56" 358 cfs
9-23, 0:00 -1.44" 625 cfs
1/1/04 0:00
1/16/04 0:00
1/31/04 0:00
2/15/04 0:00
3/1/04 0:00
3/16/04 0:00
3/31/04 0:00
4/15/04 0:00
4/30/04 0:00
5/15/04 0:00
5/30/04 0:00
6/14/04 0:00
6/29/04 0:00
7/14/04 0:00
7/29/04 0:00
8/13/04 0:00
8/28/04 0:00
9/12/04 0:00
9/27/04 0:00
10/12/04 0:00
10/27/04 0:00
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12/26/04 0:00
Date and Time (Hourly)

Figure 4

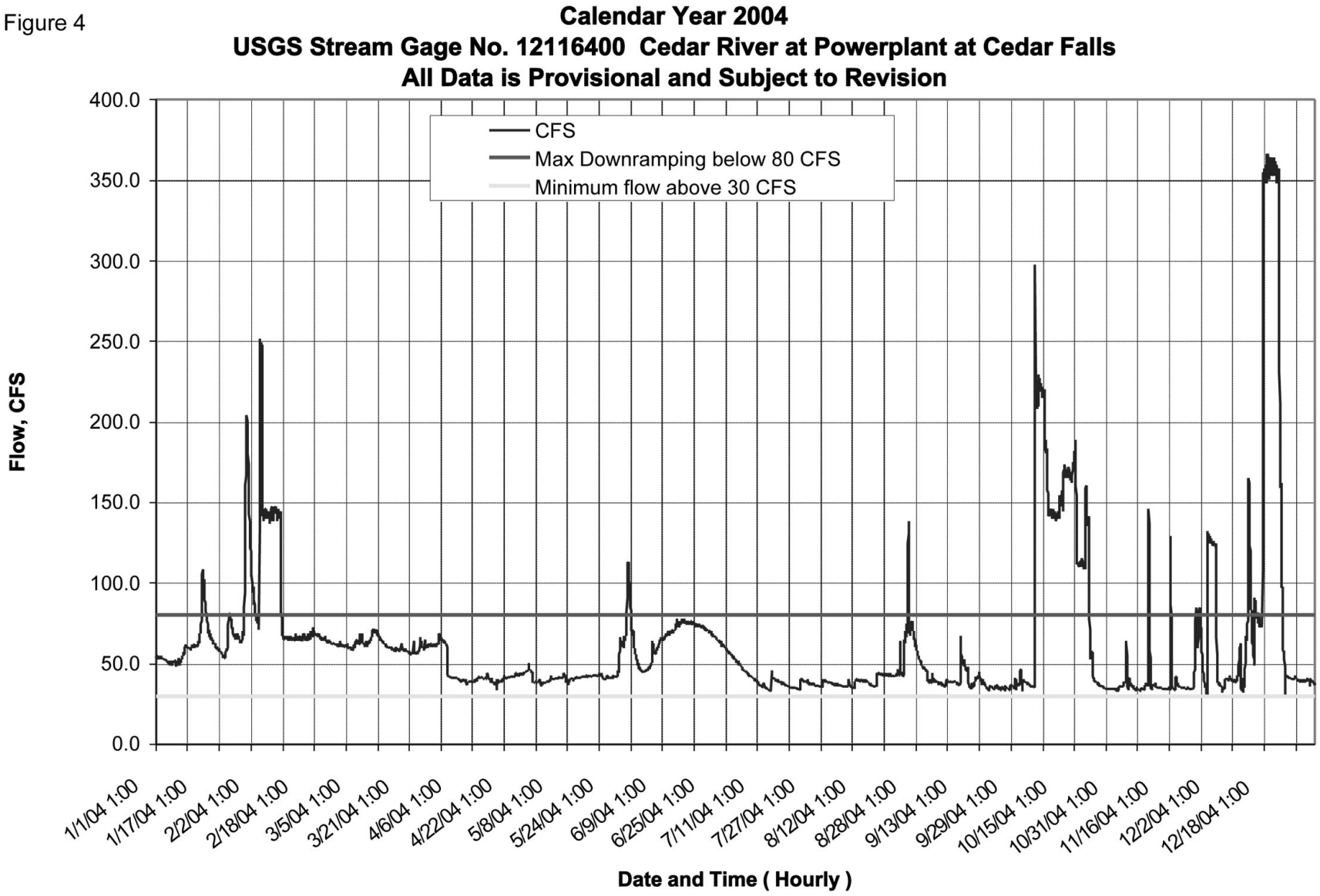
Calendar Year 2004
USGS Stream Gage No. 12116400 Cedar River at Powerplant at Cedar Falls
All Data is Provisional and Subject to Revision
CFS
Max Downramping below 80 CFS
Minimum flow above 30 CFS
Flow, CFS
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
1/1/04 1:00
1/17/04 1:00
2/2/04 1:00
2/18/04 1:00
3/5/04 1:00
3/21/04 1:00
4/6/04 1:00
4/22/04 1:00
5/8/04 1:00
5/24/04 1:00
6/9/04 1:00
6/25/04 1:00
7/11/04 1:00
7/27/04 1:00
8/12/04 1:00
8/28/04 1:00
9/13/04 1:00
9/29/04 1:00
10/15/04 1:00
10/31/04 1:00
11/16/04 1:00
12/2/04 1:00
12/18/04 1:00
Date and Time (Hourly)

Figure 5

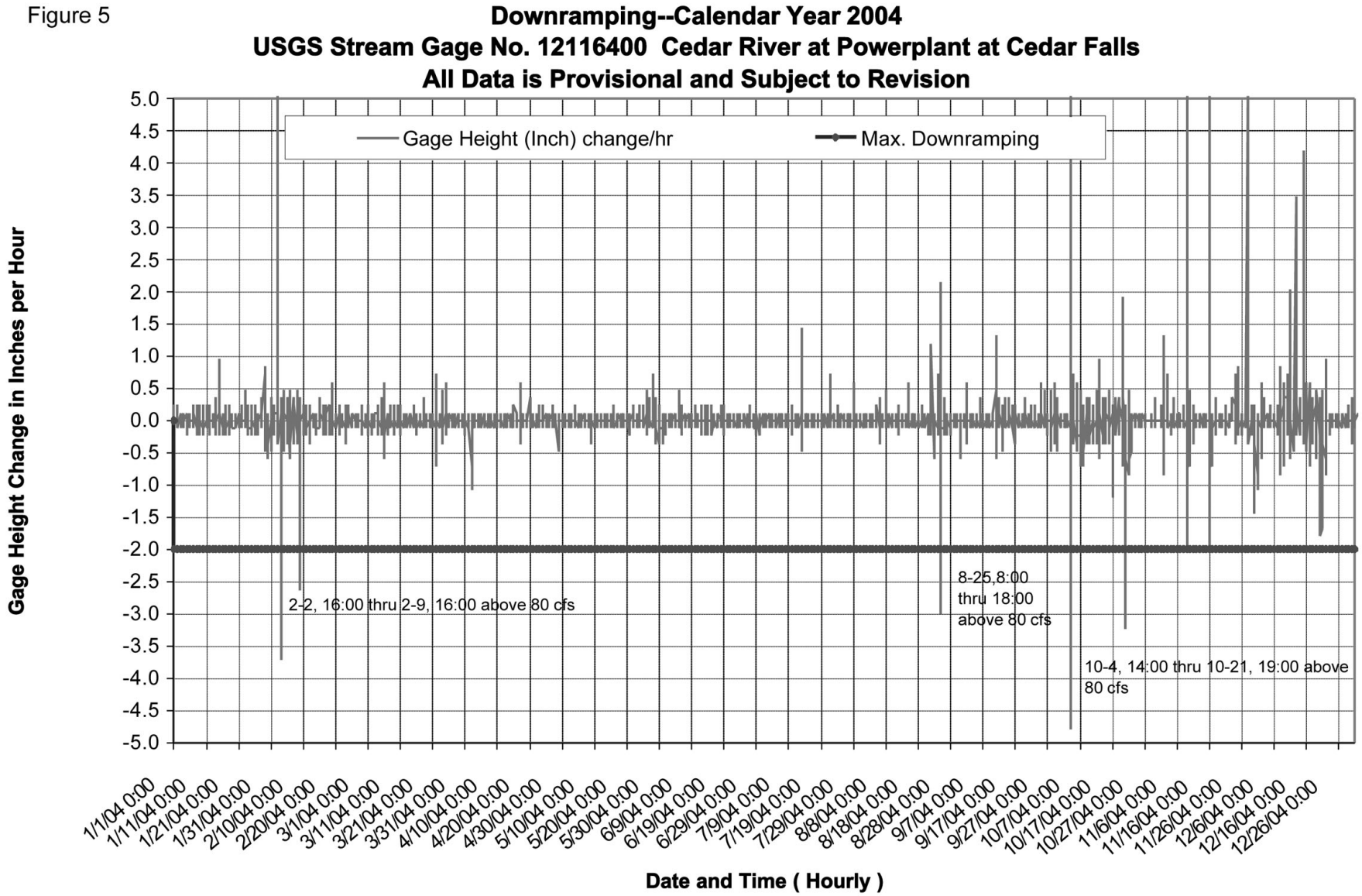
Downramping--Calendar Year 2004
USGS Stream Gage No. 12116400 Cedar River at Powerplant at Cedar Falls
All Data is Provisional and Subject to Revision
Gage Height (Inch) change/hr
Max. Downramping
Gage Height Change in Inches per Hour
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
2-2, 16:00 thru 2-9, 16:00 above 80 cfs
8-25,8:00
thru 18:00
above 80 cfs
10-4, 14:00 thru 10-21, 19:00 above
80 cfs
1/1/04 0:00
1/11/04 0:00
1/21/04 0:00
1/31/04 0:00
2/10/04 0:00
2/20/04 0:00
3/1/04 0:00
3/11/04 0:00
3/21/04 0:00
3/31/04 0:00
4/10/04 0:00
4/20/04 0:00
4/30/04 0:00
5/10/04 0:00
5/20/04 0:00
5/30/04 0:00
6/9/04 0:00
6/19/04 0:00
6/29/04 0:00
7/9/04 0:00
7/19/04 0:00
7/29/04 0:00
8/8/04 0:00
8/18/04 0:00
8/28/04 0:00
9/7/04 0:00
9/17/04 0:00
9/27/04 0:00
10/7/04 0:00
10/17/04 0:00
10/27/04 0:00
11/6/04 0:00
11/16/04 0:00
11/26/04 0:00
12/6/04 0:00
12/16/04 0:00
12/26/04 0:00
Date and Time (Hourly)

Figure 6

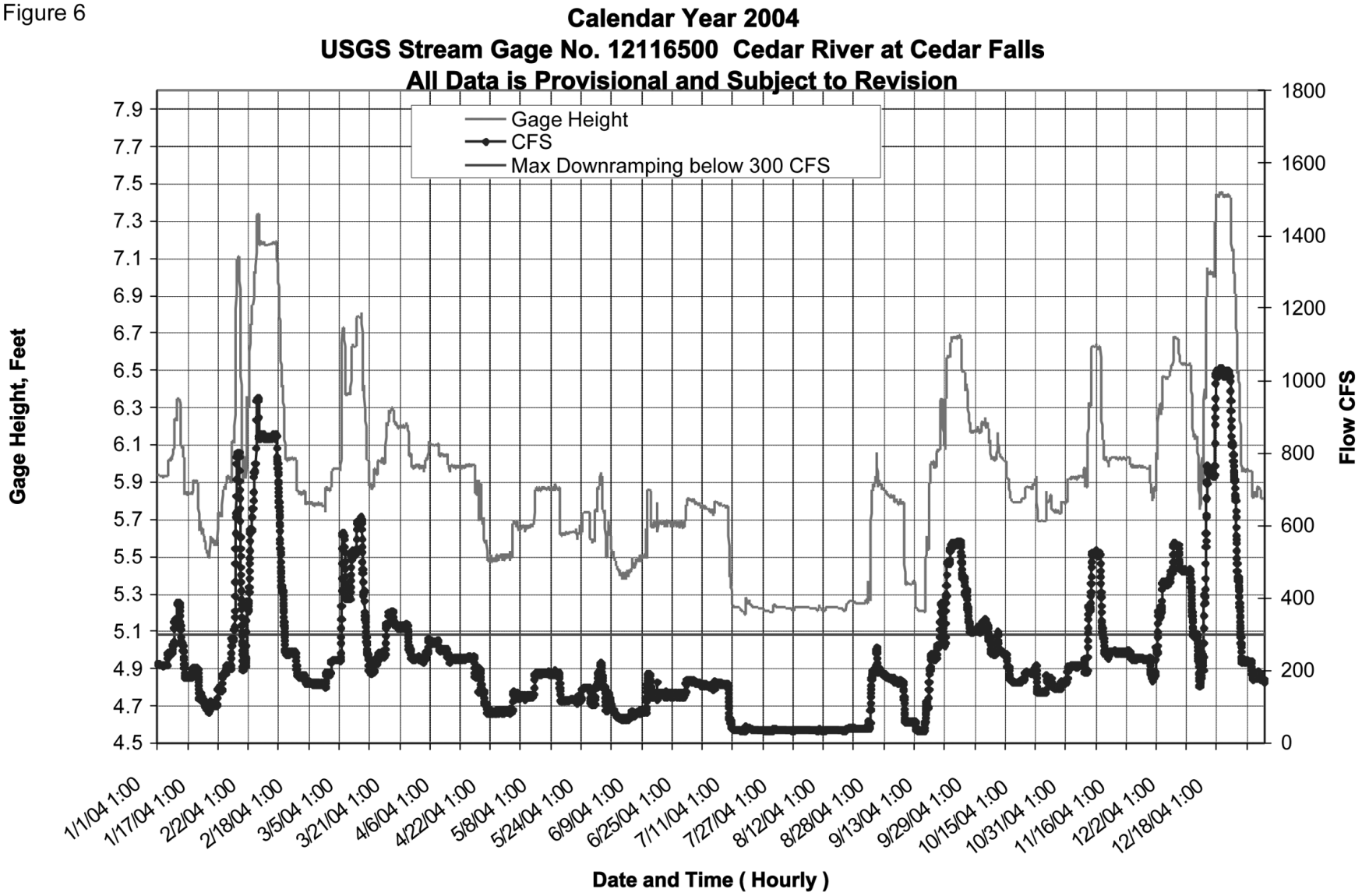
Calendar Year 2004
USGS Stream Gage No. 12116500 Cedar River at Cedar Falls
All Data is Provisional and Subject to Revision
Gage Height
CFS
Max Downramping below 300 CFS
Gage Height, Feet
Flow CFS
7.9
7.7
7.5
7.3
7.1
6.9
6.7
6.5
6.3
6.1
5.9
5.7
5.5
5.3
5.1
4.9
4.7
4.5
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/04 1:00
1/17/04 1:00
2/2/04 1:00
2/18/04 1:00
3/5/04 1:00
3/21/04 1:00
4/6/04 1:00
4/22/04 1:00
5/8/04 1:00
5/24/04 1:00
6/9/04 1:00
6/25/04 1:00
7/11/04 1:00
7/27/04 1:00
8/12/04 1:00
8/28/04 1:00
9/13/04 1:00
9/29/04 1:00
10/15/04 1:00
10/31/04 1:00
11/16/04 1:00
12/2/04 1:00
12/18/04 1:00
Date and Time (Hourly)

Figure 7

Downramping--Calendar Year 2004
USGS Stream Gage No. 12116500 Cedar River at Cedar Falls
All Data is Provisional and Subject to Revision

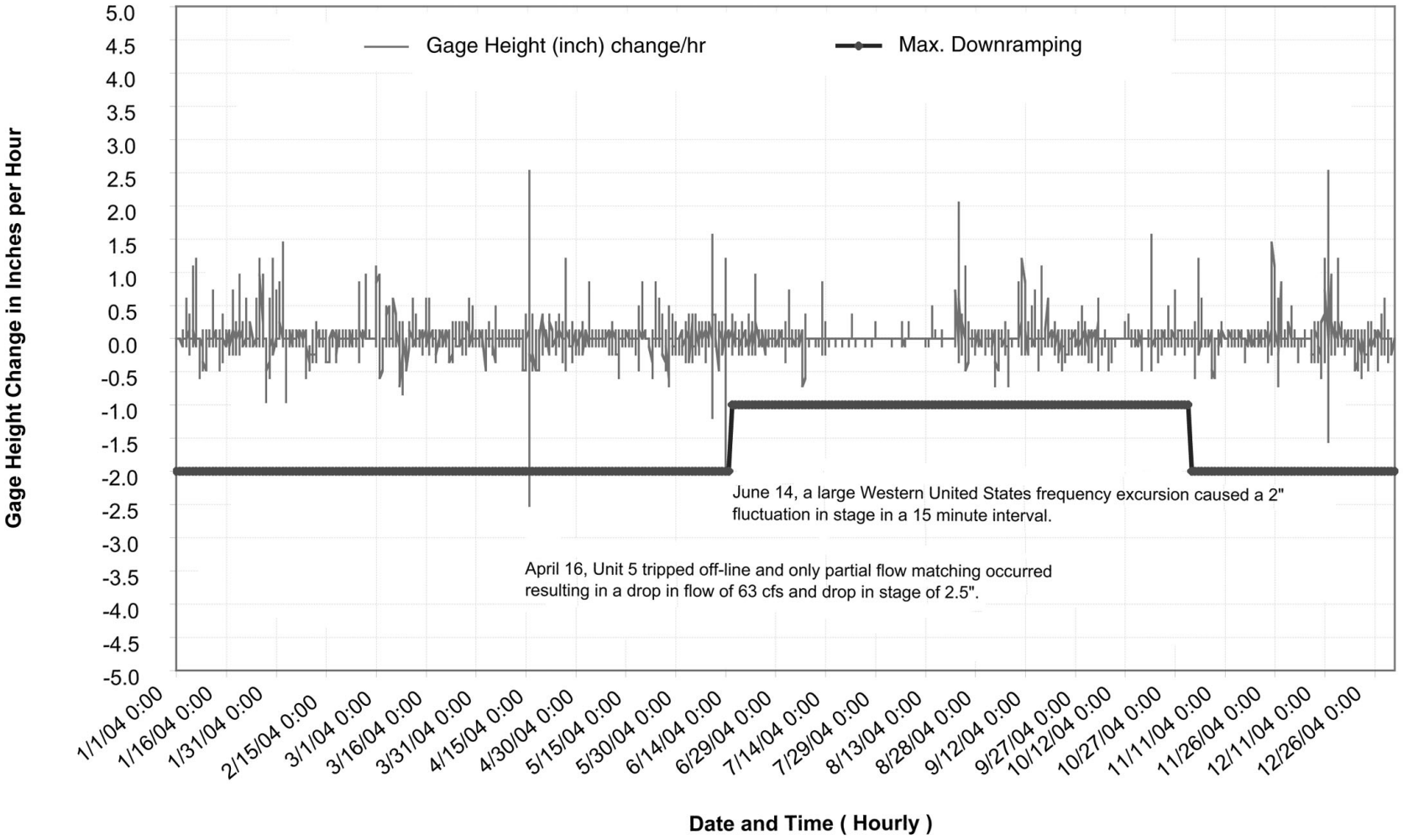

Table 1

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS

PROVISIONAL REAL-TIME

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NR LANDSBURG, WA STREAM SOURCE AGENCY USGS

LATITUDE 472247 LONGITUDE 1215856 DRAINAGE AREA 124 DATUM 490 STATE 53 COUNTY 033

PROVISIONAL DATA FROM DCP SUBJECT TO REVISION

DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2004 TO DECEMBER 2004

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	448	1280	598	458	270	301	219	100	140	373	382	681
2	444	1370	915	459	270	259	206	99	149	383	558	735
3	450	1420	809	459	268	256	217	91	137	379	515	715
4	452	1230	822	457	267	258	217	96	116	388	607	653
5	511	1130	932	458	266	261	212	90	114	381	724	663
6	517	1110	933	455	265	275	210	98	109	384	720	686
7	467	1110	952	460	267	264	218	117	106	382	703	749
8	505	1100	856	458	266	258	187	95	95	413	493	717
9	482	1120	666	458	264	279	157	94	100	419	418	689
10	465	985	538	459	268	331	162	93	94	389	405	872
11	517	768	463	461	267	403	173	97	382	378	405	1320
12	443	590	456	461	265	368	155	101	407	376	401	1200
13	460	557	457	460	265	381	152	100	413	376	399	1350
14	469	563	461	465	265	362	134	105	405	377	395	1360
15	705	550	457	422	268	311	131	112	464	377	404	1390
16	681	504	458	372	266	279	130	113	584	462	411	1500
17	457	472	465	366	265	246	130	112	539	562	405	1340
18	459	470	482	338	264	251	129	114	713	459	448	1320
19	450	480	461	309	266	248	131	127	746	416	424	1310
20	435	482	453	301	260	246	130	123	754	396	414	1280
21	446	471	463	298	256	248	128	115	743	403	409	1080
22	450	460	464	274	258	250	115	141	733	398	410	903
23	487	456	461	275	255	253	116	145	629	377	413	685
24	620	457	470	273	255	249	116	468	536	378	688	597
25	526	461	463	274	257	246	115	660	454	375	848	555
26	628	459	466	273	518	237	114	607	428	376	798	552
27	1080	461	466	272	578	231	105	580	434	375	732	518
28	1050	475	458	266	552	229	102	342	421	376	748	444
29	1650	476	461	264	842	230	101	198	390	378	734	441
30	1540		466	268	597	234	101	156	375	377	732	430
31	1280		458		434		100	142		375		402
TOTAL	19574	21467	17730	11273	10124	8244	4613	5631	11710	12258	16143	27137
MEAN	631	740	572	376	327	275	149	182	390	395	538	875
MAX	1650	1420	952	465	842	403	219	660	754	562	848	1500
MIN	435	456	453	264	255	229	100	90	94	373	382	402
AC-FT	38824	42579	35167	22360	20081	16352	9150	11169	23226	24313	32019	53825

Table 2

OPERATIONAL MINIMUM INSTREAM FLOW SCHEDULE WITH FIRM AND NON-FIRM FLOWS

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NR LANDSBURG, WA

LATITUDE 472247 LONGITUDE 1215856 DRAINAGE AREA 124 DATUM 490 STATE 53 COUNTY 033

DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2004 TO DECEMBER 2004

DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	260	260	365	365	260	250	200	95	80	210	330	330
2	260	260	365	365	260	250	200	95	80	210	330	330
3	260	260	365	365	260	250	200	80	80	210	330	330
4	260	260	365	365	260	250	200	80	80	210	330	330
5	260	260	365	365	260	250	200	80	80	210	330	330
6	260	260	365	365	260	250	175	80	80	210	330	330
7	260	260	365	365	260	250	175	80	80	265	330	330
8	260	260	365	365	260	250	175	80	80	330	330	330
9	260	260	365	365	260	250	150	80	80	330	330	330
10	260	260	365	365	260	240	150	80	80	330	330	330
11	260	365	365	365	260	240	150	80	80	330	330	330
12	260	365	365	365	260	240	150	80	80	330	330	330
13	260	365	365	365	260	240	125	80	80	330	330	330
14	260	365	365	260	260	240	125	80	80	330	330	330
15	260	365	365	260	260	240	125	80	118	330	330	330
16	260	365	365	260	260	240	125	80	133	330	330	330
17	260	365	365	260	260	240	125	80	133	330	330	330
18	260	365	365	260	260	240	125	80	133	330	330	330
19	260	365	365	260	260	240	125	80	133	330	330	330
20	260	365	365	260	250	240	125	80	133	330	330	330
21	260	365	365	260	250	240	125	80	133	330	330	330
22	260	365	365	260	250	240	110	80	133	330	330	330
23	260	365	365	260	250	240	110	80	210	330	330	330
24	260	365	365	260	250	240	110	80	210	330	330	330
25	260	365	365	260	250	240	110	80	210	330	330	330
26	260	365	365	260	250	225	110	80	210	330	330	330
27	260	365	365	260	250	225	95	80	210	330	330	330
28	260	365	365	260	250	225	95	80	210	330	330	330
29	260	365	365	260	250	225	95	80	210	330	330	330
30	260		365	260	250	225	95	80	210	330	330	275
31	260		365		250		95	80		330		260
TOTAL	8060	9535	11315	9165	7940	7215	4275	2510	3849	9445	9900	10105
MEAN	260	329	365	306	256	241	138	81	128	305	330	326
MAX	260	365	365	365	260	250	200	95	210	330	330	330
MIN	260	260	365	260	250	225	95	80	80	210	330	260
AC-FT	15987	18912	22443	18179	15749	14311	8479	4979	7634	18734	19636	20043

Table 3

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 3/7/2004
STATION NUMBER 12116500 CEDAR RIVER AT CEDAR FALLS, WASH. STREAM SOURCE AGENCY USGS
LATITUDE 472502 LONGITUDE 1214727 DRAINAGE AREA 84.20 DATUM 902.1 STATE 53 COUNTY 033
PROVISIONAL DATA FROM THE DCP SUBJECT TO REVISION
DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2004 TO DECEMBER 2004
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	218	639	272	279	125	70	156	37	169	309	214	493
2	215	818	563	280	128	67	152	37	169	263	207	548
3	215	899	404	258	130	67	166	36	148	248	289	523
4	232	847	401	258	153	68	166	36	59	267	432	476
5	249	844	518	256	191	73	164	36	58	255	525	475
6	298	841	531	235	191	78	162	36	59	249	523	474
7	359	845	610	234	193	81	146	35	50	232	488	444
8	347	845	567	233	192	85	57	35	35	194	291	307
9	258	814	376	233	192	87	38	37	35	171	249	287
10	184	589	249	233	192	107	37	37	46	168	246	180
11	183	392	197	234	193	189	36	37	103	168	252	256
12	191	257	206	237	191	133	34	37	220	172	252	527
13	204	249	227	237	122	134	39	36	239	182	251	749
14	175	250	246	234	118	134	40	35	247	194	251	746
15	127	247	245	186	118	136	38	37	299	193	251	855
16	112	188	288	197	119	136	37	41	348	199	253	1020
17	94	184	344	142	120	136	37	41	358	183	243	1030
18	102	184	360	106	118	136	36	41	498	138	235	1020
19	107	168	331	82	119	134	35	40	543	138	233	1020
20	110	167	320	84	136	134	35	40	550	155	234	983
21	149	166	321	84	153	132	34	40	550	169	233	793
22	168	164	323	87	152	131	36	43	528	167	232	607
23	197	163	323	88	110	146	38	77	451	154	232	408
24	213	163	256	87	124	174	37	193	399	153	194	242
25	244	173	234	88	175	171	37	222	322	158	191	227
26	362	191	235	89	209	169	37	202	309	168	297	226
27	782	212	233	113	159	166	36	195	311	180	364	215
28	558	229	232	135	100	164	35	186	313	211	441	181
29	234	229	239	126	123	161	36	181	321	212	439	187
30	311	---	266	125	93	159	37	178	327	212	450	186
31	486	---	281	---	79	---	37	173	---	214	---	174
TOTAL	7684	11957	10198	5260	4518	3758	2011	2437	8064	6076	8992	15859
MEAN	248	412	329	175	146	125	65	79	269	196	300	512
MAX	782	899	610	280	209	189	166	222	550	309	525	1030
MIN	94	163	197	82	79	67	34	35	35	138	191	174
AC-FT	15240	23720	20230	10430	8960	7450	3990	4830	15990	12050	17840	31460

Table 4

SEATTLE PUBLIC UTILITIES

Daily Readings Approximately 7am

STATION NUMBER 12115900 CHESTER MORSE LAKE AT CEDAR FALLS, WASH.

LATITUDE 472434 LONGITUDE 1214322 DRAINAGE AREA 78.4 sq mi

PROVISIONAL DATA SUBJECT TO REVISION

RESERVOIR ELEVATION SURFACE WATER (FEET), CALENDER YEAR JANUARY 2004 TO DECEMBER 2004

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	1545.03	1556.80	1550.00	1550.70	1554.99	1561.24	1560.42	1554.55	1552.65	1550.89	1549.25	1551.58
2	1544.56	1556.80	1549.90	1550.72	1555.22	1561.68	1560.13	1554.22	1552.79	1550.78	1549.40	1551.26
3	1544.52	1556.30	1549.40	1550.75	1555.48	1561.96	1559.90	1554.10	1552.78	1550.72	1550.35	1550.90
4	1544.52	1555.75	1549.19	1550.80	1555.67	1562.10	1559.62	1553.95	1552.69	1550.68	1550.70	1550.56
5	1544.50	1555.19	1549.10	1550.89	1555.86	1562.21	1559.35	1553.71	1552.68	1550.65	1550.68	1550.32
6	1544.50	1554.50	1548.89	1550.97	1555.97	1562.50	1559.07	1553.53	1552.60	1550.65	1550.50	1550.03
7	1544.50	1554.15	1548.55	1550.31	1555.96	1562.68	1558.85	1553.47	1552.52	1550.69	1550.22	1549.72
8	1544.32	1553.00	1548.30	1551.09	1555.96	1562.85	1558.64	1553.40	1552.45	1550.60	1550.00	1549.54
9	1543.60	1552.80	1548.20	1551.15	1555.98	1563.00	1558.43	1553.15	1552.42	1550.67	1549.75	1549.85
10	1543.40	1552.15	1548.50	1551.24	1555.98	1563.16	1558.26	1552.95	1552.36	1550.71	1549.60	1550.60
11	1543.43	1551.80	1548.90	1551.45	1555.98	1563.18	1558.25	1552.75	1552.54	1550.69	1549.43	1553.85
12	1543.52	1551.55	1549.18	1551.70	1555.95	1563.14	1558.08	1552.56	1552.81	1550.65	1549.24	1555.95
13	1543.47	1551.35	1549.36	1552.01	1555.88	1563.10	1557.92	1552.38	1552.81	1550.62	1549.02	1556.32
14	1543.52	1551.27	1549.45	1552.28	1555.88	1563.25	1557.70	1552.18	1552.92	1550.55	1548.85	1556.15
15	1544.02	1551.10	1549.50	1552.50	1555.86	1563.28	1557.51	1551.95	1553.10	1550.50	1548.55	1556.29
16	1545.56	1551.00	1549.55	1552.70	1555.88	1563.26	1557.37	1551.75	1553.59	1550.40	1548.35	1555.95
17	1546.50	1550.90	1549.55	1552.86	1555.88	1563.21	1557.18	1551.58	1554.05	1550.83	1548.20	1555.39
18	1547.17	1550.85	1549.50	1552.99	1555.86	1563.13	1557.03	1551.48	1554.23	1551.08	1548.03	1555.00
19	1547.72	1550.88	1549.52	1553.11	1555.85	1563.00	1556.83	1551.18	1554.31	1550.75	1547.91	1554.28
20	1547.70	1550.90	1549.52	1553.29	1555.83	1562.90	1556.65	1551.00	1554.00	1550.40	1547.72	1553.63
21	1548.51	1551.90	1549.35	1553.43	1555.71	1562.70	1556.48	1550.82	1553.70	1550.30	1547.55	1553.02
22	1548.87	1550.80	1549.30	1553.54	1555.69	1562.55	1556.27	1550.72	1553.31	1550.25	1547.35	1552.55
23	1549.10	1550.75	1549.20	1553.63	1555.86	1562.36	1556.08	1550.72	1552.97	1550.16	1547.18	1552.19
24	1549.87	1550.70	1549.25	1553.82	1555.87	1562.15	1555.88	1550.90	1552.67	1550.10	1547.38	1552.08
25	1550.50	1550.70	1549.50	1553.98	1555.83	1561.92	1555.69	1551.40	1552.38	1550.10	1549.28	1552.02
26	1550.88	1550.52	1549.62	1554.11	1555.82	1561.70	1555.49	1552.20	1552.15	1550.08	1551.10	1552.05
27	1550.45	1550.40	1549.76	1554.38	1556.35	1561.45	1555.28	1552.85	1551.88	1549.98	1551.77	1552.02
28	1549.97	1550.30	1549.90	1554.70	1556.88	1561.20	1555.06	1553.08	1551.54	1549.82	1551.98	1551.95
29	1550.89	1550.20	1550.10	1554.90	1557.98	1560.95	1554.98	1553.15	1551.22	1549.66	1551.95	1552.89
30	1555.00		1550.30	1554.95	1559.25	1560.62	1554.90	1553.10	1550.98	1549.50	1551.78	1551.86
31	1556.53		1550.60		1560.48		1554.73	1552.99		1549.40		1551.78
MEAN	1546.99	1552.25	1549.39	1552.50	1556.18	1562.41	1557.36	1552.51	1552.77	1550.41	1549.44	1552.63
MAX	1556.53	1556.80	1550.60	1554.95	1560.48	1563.28	1560.42	1554.55	1554.31	1551.08	1551.98	1556.32
MIN	1543.40	1550.20	1548.20	1550.31	1554.99	1560.62	1554.73	1550.72	1550.98	1549.40	1547.18	1549.54

Table 5

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - WASHINGTON STATE NWIS 3/7/2004
STATION NUMBER 12115000 CEDAR RIVER NEAR CEDAR FALLS, WASH. STREAM SOURCE AGENCY USGS
LATITUDE 472213 LONGITUDE 1213726 DRAINAGE AREA 40.70 DATUM 1560.00 STATE 53 COUNTY 033
PROVISIONAL DATA FROM THE DCP SUBJECT TO REVISION
DISCHARGE, CUBIC FEET PER SECOND, CALENDER YEAR JANUARY 2004 TO DECEMBER 2004
DAILY MEAN VALUES

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	109	545	130	319	391	572	92	41	135	100	162	236
2	103	419	127	281	427	451	88	40	182	93	515	209
3	98	342	131	280	399	398	88	39	150	89	494	192
4	97	300	171	312	384	377	84	39	133	84	377	184
5	95	256	191	315	366	376	80	38	124	81	306	177
6	94	231	189	297	306	475	79	43	113	104	258	163
7	93	213	189	305	283	501	82	65	104	88	224	160
8	93	195	249	310	293	525	77	46	98	90	198	244
9	98	179	384	317	282	575	73	40	101	123	178	274
10	101	166	417	337	262	606	73	38	92	129	161	1190
11	96	157	363	410	247	601	86	37	274	115	148	1820
12	98	148	332	476	229	575	71	36	215	106	137	833
13	102	141	295	465	219	615	67	35	240	99	129	543
14	120	138	273	418	215	637	64	35	342	94	121	488
15	256	132	262	370	223	635	62	35	427	91	120	492
16	355	128	253	332	232	613	59	34	499	144	118	415
17	280	125	262	299	220	584	57	33	453	235	117	359
18	253	136	276	274	219	541	56	33	404	261	127	326
19	241	154	269	256	239	490	56	32	352	246	133	341
20	217	147	244	260	224	437	55	32	299	218	119	326
21	197	139	230	250	219	385	52	32	253	197	112	291
22	182	132	238	238	275	334	50	49	223	191	120	258
23	223	128	290	263	261	285	49	63	200	180	126	232
24	332	126	323	282	224	235	47	230	176	191	506	213
25	299	125	312	272	211	193	46	512	158	182	1070	205
26	274	122	295	312	400	158	45	467	143	169	701	194
27	259	122	321	409	435	133	44	376	131	158	485	177
28	375	133	316	392	447	116	44	273	121	148	367	166
29	1630		325	337	810	105	43	210	114	142	299	163
30	1560		381	338	825	97	42	172	107	158	264	156
31	797		370	---	793	---	41	145	---	150	---	145
TOTAL	9127	5279	8408	9726	10560	12625	1952	3300	6363	4456	8192	11172
MEAN	294	189	271	324	341	421	63	106	212	144	273	360
MAX	1630	545	417	476	825	637	92	512	499	261	1070	1820
MIN	93	122	127	238	211	97	41	32	92	81	112	145
AC-FT	18100	10740	16680	19290	20950	25040	3870	6550	12620	8840	16250	22160
CFSM	7.23	4.59	6.66	7.97	8.37	10.3	1.55	2.62	5.21	3.53	6.71	8.85
IN.	8.34	4.95	7.68	8.89	9.65	11.54	1.78	3.02	5.82	4.07	7.49	10.21

Table 6

SEATTLE PUBLIC UTILITIES
LANDSBURG TUNNEL - FLOW VOL 24HR TOT - MG
YEAR 2004
from IWRMS 3-7-05

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	50.3	0	0	90.9	74.3	135.2	149.8	131.6	194.9	123.4	63.9	119.1
2	45.1	0	0	86.9	74.6	126.1	152.1	132.5	198.3	99.9	31.6	120.3
3	40.4	44.3	0	69.9	76.1	113.5	149.1	131.5	184.6	90	75.6	120.2
4	44.6	122.4	0	71.2	97.9	102.5	156	133.3	143.7	91.2	79.1	118.9
5	0	140.6	0	67.7	114.5	112.8	152.6	128.9	141.9	89.4	79.1	119.6
6	73.4	144.6	5.6	54.1	111.8	124.4	157.7	132.8	141.1	87.8	80	82.1
7	132.3	143.4	21	49	111.7	120.8	139.2	134.2	137.8	69.5	79	57.7
8	105.2	145.4	95.4	50.2	115.7	115.5	119	131.8	136.7	46.3	78.8	53.6
9	74.8	90.9	95	46.2	115.5	83.6	119	130.6	130.3	39.8	79.3	52.1
10	61	70.3	89.4	43.8	115.5	68.1	119	129.5	130.4	41.8	79.5	0
11	33.9	70.3	84.3	42.2	127.9	68	117.2	126.2	15.7	40.2	80.6	0
12	73.2	73.5	83.7	42.8	115.4	68.2	112.3	124.1	70.9	41.5	79.6	0
13	79.6	72.9	89.4	42.9	75.7	67.9	120.9	122.3	78.2	46	80	0
14	67.9	74.7	93.4	43.4	71.5	75.4	128.3	117.1	79.2	50.4	80	0
15	4.4	75.9	92.4	54.1	71.3	102.6	128.2	115	71.7	48.7	80	0
16	56.8	76.6	118.7	78.3	72.8	122	126.3	116.6	72.1	46.2	77.2	64.3
17	81.6	84.7	141.5	46.8	72.4	130	126	115.8	80.6	49.8	71.4	119.2
18	67.5	86.6	143.3	45.2	69.2	126.6	125	113.5	80	49.2	63.3	119.5
19	62.1	62.1	140.1	47.2	69.7	126	120.3	109.2	81	49.4	62.8	119.4
20	58.4	59	128.8	52.1	78.7	122.8	123.5	111.7	81	49.3	62.4	119.3
21	55.1	58.7	122	51.8	99	118.9	122.7	113.8	80.7	50	63.1	118.2
22	61.4	58	122.4	62.8	108.1	117.5	127.5	114.1	79.6	49.3	61.6	119.1
23	105.8	54.2	116.9	66	79.6	125.1	126.9	132	149.7	48	49.7	81.9
24	119.1	49.9	89.6	63.2	84.4	141.2	125.3	14.7	110	42.3	0	41.8
25	118.4	52.4	76.9	58.9	117.1	142.1	129.3	0	106.5	44.7	0	40.8
26	110.6	62.5	76.7	58.2	30	148.9	127.4	0	99.1	46.3	16.9	40.9
27	93	81	76.7	73.3	34.2	143.8	127.8	31.1	102.6	52.3	60.1	54.7
28	57.5	83.1	71.1	89.8	40.7	144.2	131.2	131.9	114.1	66.8	60.3	63.3
29	0	57.2	71.5	81.8	1.1	141.2	130.2	195.5	140.8	67	59.7	76.1
30	0		92.1	77.4	57.9	139.6	132.6	195	141.4	70.7	85.8	79.5
31	0		96.2		105.3		133	197		66.5		80.1
TOTAL	1933.4	2195.2	2434.1	1808.1	2589.6	3474.5	4055.4	3613.3	3374.6	1853.7	1920.4	2181.7
MEAN	62.4	75.7	78.5	60.3	83.5	115.8	130.8	116.6	112.5	59.8	64.0	70.4
MAX	132.3	145.4	143.3	90.9	127.9	148.9	157.7	197	198.3	123.4	85.8	120.3
MIN	0	0	0	42.2	1.1	67.9	112.3	0	15.7	39.8	0	0

Average CY 2004 85.89

Table 7

SEATTLE PUBLIC UTILITIES
LANDSBURG WEATHER STATION - PRECIP 24HR TOT
YEAR 2004

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
2	0.00	0.06	0.00	0.00	0.00	0.00	0.01	0.00	0.27	0.00	1.24	0.00
3	1.20	0.08	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
4	0.55	0.00	0.30	0.00	0.38	0.00	0.00	0.00	0.02	0.00	0.00	0.14
5	1.50	0.52	0.32	0.00	0.00	0.71	0.00	0.00	0.00	0.24	0.00	0.18
6	0.00	0.27	0.02	0.00	0.00	0.19	0.03	0.78	0.00	0.10	0.02	0.21
7	1.30	0.09	0.11	0.00	0.25	0.15	0.13	0.15	0.00	0.00	0.00	0.61
8	0.41	0.00	0.00	0.00	0.32	0.03	0.02	0.00	0.34	1.21	0.00	0.55
9	0.18	0.00	0.18	0.00	0.00	0.00	0.01	0.00	0.10	0.10	0.00	0.66
10	0.28	0.00	0.00	0.00	0.45	0.00	0.83	0.00	0.27	0.00	0.00	1.24
11	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.80	0.00	0.00	0.49
12	0.10	0.00	0.00	0.01	0.00	0.10	0.00	0.00	0.28	0.00	0.00	0.00
13	0.04	0.00	0.00	0.07	0.00	0.37	0.00	0.00	0.32	0.00	0.12	0.61
14	0.46	0.28	0.02	0.28	0.00	0.01	0.00	0.00	0.13	0.00	0.02	0.33
15	0.40	0.11	0.00	0.50	0.20	0.00	0.00	0.00	0.24	0.00	0.33	0.00
16	0.00	0.60	0.00	0.15	0.02	0.00	0.00	0.00	0.38	1.11	0.20	0.01
17	0.02	0.21	0.06	0.04	0.00	0.00	0.00	0.00	0.31	1.00	0.10	0.00
18	0.34	0.22	0.30	0.05	0.00	0.00	0.00	0.00	0.29	0.11	0.66	0.00
19	0.03	0.00	0.07	0.17	0.00	0.00	0.00	0.00	0.17	0.04	0.01	0.00
20	0.00	0.00	0.00	0.13	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
21	0.00	0.01	0.00	0.12	0.00	0.00	0.00	0.21	0.00	0.04	0.02	0.03
22	0.11	0.00	0.01	0.00	0.49	0.00	0.00	0.98	0.23	0.07	0.17	0.00
23	1.40	0.00	0.06	0.28	0.00	0.00	0.00	0.03	0.00	0.00	0.65	0.00
24	0.07	0.02	0.52	0.00	0.00	0.00	0.00	2.23	0.00	0.00	0.72	0.00
25	0.10	0.03	0.49	0.00	0.52	0.08	0.00	0.63	0.00	0.00	0.60	0.13
26	0.29	0.31	0.23	0.00	1.11	0.00	0.00	2.76	0.00	0.00	0.06	0.02
27	0.03	0.33	0.04	0.20	0.98	0.00	0.00	0.01	0.10	0.00	0.23	0.00
28	0.90	0.33	0.00	0.00	1.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	2.05		0.00	0.00	0.09	0.00	0.00	0.00	0.02	0.02	0.13	0.47
30	0.40		0.36	0.00	0.27	0.00	0.00	0.00	0.00	0.05	0.33	0.14
31	0.20		0.02		0.01		0.00	0.00		0.00		0.00
TOTAL	12.36	3.48	3.74	2.00	7.01	1.64	1.05	7.78	4.27	4.09	5.90	5.82
MEAN	0.40	0.12	0.12	0.07	0.23	0.05	0.03	0.25	0.14	0.13	0.20	0.19
MAX	2.05	0.60	0.63	0.50	1.68	0.71	0.83	2.76	0.80	1.21	1.24	1.24
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8

SEATTLE PUBLIC UTILITIES
MASONRY WEATHER STATION - PRECIP 24HR TOT
YEAR 2004

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.07	0.00	2.13	0.00
2	0.21	0.00	0.05	0.00	0.00	0.00	0.10	0.00	0.05	0.00	0.69	0.00
3	0.27	0.63	0.98	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.06
4	0.10	0.04	0.54	0.00	0.45	0.04	0.00	0.00	0.06	0.00	0.00	0.46
5	0.03	0.00	0.48	0.00	0.00	1.38	0.00	0.00	0.00	0.54	0.00	0.16
6	1.99	0.67	0.19	0.00	0.04	0.21	0.28	1.36	0.00	0.03	0.00	0.45
7	0.66	0.40	0.05	0.00	0.14	0.17	0.05	0.00	0.00	0.00	0.00	1.95
8	0.15	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.32	1.23	0.00	0.69
9	0.58	0.00	0.10	0.00	0.01	0.22	0.17	0.00	0.02	0.28	0.00	1.52
10	0.00	0.00	0.00	0.00	0.46	0.07	0.88	0.00	1.98	0.00	0.00	2.43
11	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.31	0.00	0.00	0.00
12	0.21	0.00	0.00	0.00	0.30	0.50	0.00	0.00	0.40	0.00	0.08	0.00
13	0.08	0.61	0.00	0.07	0.00	0.29	0.00	0.00	0.16	0.00	0.00	0.56
14	0.83	0.19	0.00	0.50	0.00	0.07	0.00	0.00	0.69	0.00	0.00	0.55
15	0.87	0.11	0.00	0.35	0.25	0.00	0.00	0.00	0.57	0.71	0.58	0.00
16	0.00	0.16	0.00	0.16	0.06	0.00	0.00	0.00	0.76	1.44	0.31	0.00
17	0.23	0.42	0.06	0.01	0.00	0.00	0.00	0.00	0.29	0.79	0.87	0.00
18	0.33	0.58	0.99	0.00	0.00	0.00	0.00	0.00	0.39	0.22	0.25	0.06
19	0.00	0.00	0.00	0.63	0.00	0.00	0.11	0.00	0.18	0.00	0.05	0.13
20	0.00	0.00	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
21	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.85	0.00	0.00	0.18	0.00
22	0.84	0.00	0.00	0.00	0.51	0.00	0.00	1.90	0.25	0.00	0.13	0.00
23	1.36	0.00	0.11	0.34	0.00	0.00	0.00	1.73	0.03	0.27	1.73	0.00
24	0.44	0.00	0.80	0.00	0.00	0.00	0.00	2.08	0.00	0.14	1.92	0.06
25	0.64	0.00	0.49	0.00	0.90	0.00	0.00	0.82	0.00	0.00	0.58	0.49
26	0.37	0.31	0.59	0.00	0.94	0.00	0.00	0.45	0.00	0.00	0.35	0.00
27	0.74	0.23	0.00	0.00	1.18	0.00	0.00	0.10	0.00	0.00	0.24	0.00
28	3.10	0.09	0.00	0.00	1.85	0.00	0.00	0.05	0.00	0.10	0.00	0.10
29	1.98	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.24	0.36	0.33
30	0.25	0.00	0.61	0.00	0.75	0.00	0.00	0.00	0.00	0.07	0.30	0.00
31	0.18	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	16.67	4.44	6.04	2.48	9.11	2.95	1.59	9.34	7.53	6.06	10.75	10.04
MEAN	0.5	0.1	0.2	0.1	0.3	0.1	0.1	0.3	0.2	0.2	0.3	0.3
MAX	3.1	0.67	0.99	0.63	1.85	1.38	0.88	2.08	1.98	1.44	2.13	2.43
MIN	0	0	0	0	0	0	0	0	0	0	0	0

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA FEBRUARY 11, 2004 Pacific Standard Time SUBJECT TO REVISION

(96)	835	824	819	802	802	780	770	764	764	764	770	764
	764	753	759	764	791	808	791	775	727	711	706	701

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA MAY 26, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	265 @	265 @	265 @	265 @	268 @	272 @	275 @	278 @	282 @	292 @	317 @	339 @
	402 @	611 @	743 @	824 @	863 @	858 @	786 @	780 @	759 @	743 @	738 @	722 @

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING MEANINGS —
@ = COMPUTED FROM VALUE(S) REVIEWED BY USGS PERSONNEL

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA MAY 28, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	563 @	577 @	587 @	596 @	591 @	563 @	549 @	540 @	526 @	513	504	508
	513	517	513	486	482	443	464	482	526	572	650	830

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING EANINGS —
@ = COMPUTED FROM VALUE(S) REVIEWED BY USGS PERSONNEL

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA AUGUST 24, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	141	151	167	173	170	154	157	167	199	321	655	738
	630	711	706	680	660	640	635	655	621	625	621	611

PROVISIONAL DATA AUGUST 25, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	621	625	621	621	625	630	645	645	630	601	611	640
	824	753	717	686	660	660	665	670	675	675	680	675

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA SEPTEMBER 11, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	124	124	138	173	196	208	235	306	398	582	606	554
	513	486	477	460	451	447	434	434	426	422	418	414

PROVISIONAL DATA SEPTEMBER 12, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	414	410	358	390	378	382	406	414	422	422	418	422
	418	414	414	410	414	426	422	414	410	406	402	402

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Discharge FROM DCP, IN cfs COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA SEPTEMBER 22, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	738	743	743	738	743	738	743	743	743	743	743	738
	743	743	743	743	748	738	732	727	717	701	701	686

PROVISIONAL DATA SEPTEMBER 23, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	625	675	645	640	640	640	640	640	640	645	640	640
	645	640	645	645	645	635	606	606	587	591	587	587

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA FEBRUARY 11, 2004 Pacific Standard Time SUBJECT TO REVISION

(96)	4.49	4.47	4.46	4.43	4.43	4.39	4.37	4.36	4.36	4.36	4.37	4.36
	4.36	4.34	4.35	4.36	4.41	4.44	4.41	4.38	4.29	4.26	4.25	4.24

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA MAY 26, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	3.21 @	3.22 @	3.21 @	3.21 @	3.23 @	3.24 @	3.25 @	3.26 @	3.27 @	3.30 @	3.37 @	3.43 @
	3.59 @	4.06 @T	4.32 @	4.47 @	4.54 @	4.53 @	4.40 @	4.39 @	4.35 @	4.32 @	4.31 @	4.28 @

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING MEANINGS —
T = THIS VALUE EXCEEDS THE "STANDARD DIFFERENCE" THRESHOLD
@ = COMPUTED FROM VALUE(S) REVIEWED BY USGS PERSONNEL

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA MAY 28, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	3.96 @	3.99 @	4.01 @	4.03 @	4.02 @	3.96 @	3.93 @	3.91 @	3.88 @	3.85	3.83	3.84
	3.85	3.86	3.85	3.79	3.78	3.69	3.74	3.78	3.88	3.98	4.14	4.48

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING MEANINGS —
@ = COMPUTED FROM VALUE(S) REVIEWED BY USGS PERSONNEL

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA AUGUST 24, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	2.77	2.81	2.87	2.90	2.88	2.82	2.83	2.87	2.99	3.38 T	4.15	4.31
	4.10	4.26	4.25	4.20	4.16	4.12	4.11	4.15	4.08	4.09	4.08	4.06

PROVISIONAL DATA AUGUST 25, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	4.08	4.09	4.08	4.08	4.09	4.10	4.13	4.13	4.10	4.04	4.06	4.12
	4.47	4.34	4.27	4.21	4.16	4.16	4.17	4.18	4.19	4.19	4.20	4.19

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING MEANINGS —
T = THIS VALUE EXCEEDS THE "STANDARD DIFFERENCE" THRESHOLD

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA SEPTEMBER 11, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	2.69	2.69	2.76	2.90	2.98	3.02	3.12	3.34	3.58	4.00 T	4.05	3.94
	3.85	3.79	3.77	3.73	3.71	3.70	3.67	3.67	3.65	3.64	3.63	3.62

PROVISIONAL DATA SEPTEMBER 12, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	3.62	3.61	3.48	3.56	3.53	3.54	3.60	3.62	3.64	3.64	3.63	3.64
	3.63	3.62	3.62	3.61	3.62	3.65	3.64	3.62	3.61	3.60	3.59	3.59

NOTE: SYMBOLS USED ABOVE HAVE THE FOLLOWING MEANINGS —
T = THIS VALUE EXCEEDS THE "STANDARD DIFFERENCE" THRESHOLD

U.S. DEPARTMENT OF THE INTERIOR - U.S. GEOLOGICAL SURVEY - WATER RESOURCES

STATION NUMBER 12117600 CEDAR RIVER BELOW DIVERSION NEAR LANDSBURG, WA SOURCE AGENCY USGS STATE 53 COUNTY 033
LATITUDE 472247 LONGITUDE 1215856 NAD27 DRAINAGE AREA 124 CONTRIBUTING DRAINAGE AREA DATUM 490 NGVD29
Date Processed: 2005-03-15 16:04 By johanson
Gage height FROM DCP, IN feet COMPUTED UNIT VALUES (INSTANTANEOUS)

	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100
(# VALUES)	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300

PROVISIONAL DATA SEPTEMBER 22, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	4.31	4.32	4.32	4.31	4.32	4.31	4.32	4.32	4.32	4.32	4.32	4.31
	4.32	4.32	4.32	4.32	4.33	4.31	4.30	4.29	4.27	4.24	4.24	4.21

PROVISIONAL DATA SEPTEMBER 23, 2004 Pacific Daylight Time SUBJECT TO REVISION

(96)	4.09	4.19	4.13	4.12	4.12	4.12	4.12	4.12	4.12	4.13	4.12	4.12
	4.13	4.12	4.13	4.13	4.13	4.11	4.05	4.05	4.01	4.02	4.01	4.01